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Science and the Public: A Report in Three Volumes

Volume I:

Searching for Common Ground on Issues Related to Science and Technology

SCIENCE AND THE PUBLIC: A REPORT IN THREE VOLUMES

Volume I: Searching for Common Ground on Issues Related to Science and Technology

A Study for the Charles F. Kettering Foundation
Comparing the Perspectives of Citizens and Scientists

by

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Introduction

Science and the Public: Issues and Methods

In 1988, the Public Agenda Foundation, which is dedicated to enhancing the public's ability to resolve complex political and social issues, was asked by the Kettering Foundation, its collaborator and partner on numerous projects of common interest, to explore the public's capacity to think through policy issues that concern matters of scientific or technological complexity.

Ongoing work by Public Agenda and Kettering has shown that exposure to brief, highly-focused, well-researched, educational interventions on contentious social or political problems can help the general public develop understandings and assessments that are often more realistic and consistent than earlier views. In the language of Public Agenda, the public can move from mass opinion -- top-of-the-head views -- to judgment, a more measured and thoughtful analysis.

The questions were: Could the same process hold for scientific issues that were threaded with uncertainty? Or were such technical issues intrinsically different from social or political problems, however contentious? Did issues of scientific complexity raise considerations that, in essence, were beyond the public's understanding?

As our first step, we carefully defined the kind of issues that would best illuminate the public's response to matters of scientific or technological complexity. With the aid of the Harwood Group, a research organization in Washington, D.C., which conducted a series of interviews with leading scientists, and decision makers (including former EPA Administrator Lee Thomas, former White House Science Advisor George Keyworth and National Science Foundation Director Erich Bloch), we determined that the issue should have three characteristics:

1. Leading science and technology experts should be concerned about the ability of the public to grasp the issue.
2. Existing public opinion data should suggest that the public displays widespread misunderstanding of the issue.

3. Recent experience should suggest that policy debate on the issue has been marked by conflicting scientific or technological claims about the seriousness of the issue or the usefulness and/ or safety of proposed solutions.

After further preliminary study, including eight focus groups with the general public (in Birmingham, Boston, Chicago, Houston, Nashville, New York, Omaha, and San Francisco), we chose to explore the public's thinking on two exemplary environmental issues: the disposal of solid waste and the threat of global warming caused by the greenhouse effect.

These issues form a good basis for analysis because they simultaneously have important similarities and differences.

In terms of their similarities, both issues:

1. Are a source of sharp political controversy;
2. Are scientifically complex and packed with technical information;
3. Involve broad areas of scientific uncertainty or questions about which experts disagree;
4. Involve a certain degree of risk as well as difficult and controversial trade-offs; and
5. Are subjects that leadership has found it difficult to communicate about with the public, both nationally and in various communities.

In terms of their differences, the two issues present clear contrasts:

1. Solid waste disposal is essentially a local issue while the threat of global warming caused by the greenhouse effect is national/ international in scope.
2. Solid waste disposal is an immediate problem while the greenhouse effect is a long-term problem.
3. Solid waste disposal poses serious but essentially moderate risks while the greenhouse effect has the potential to be catastrophic.
4. Solid waste disposal involves areas in which scientific uncertainty is rather narrow and clear-cut (focusing mainly on incinerator safety) while the greenhouse effect is a subject in which

high uncertainty and disagreement surrounds many elements, including the diagnosis of the problem, its potential effects, and when the effects may be felt.

5. The resolution of waste disposal and the greenhouse effect are likely to involve proposals or solutions that place different types of burdens on the general public (e.g., the public may regard a gasoline tax as far more burdensome than recycling).

To investigate the public's opinions about the issues and its ability to think about them, we used a research method called a Citizen Review Panel in which we examine people's views at two points in time: first, in the present, at their current, unenhanced level of understanding -- that is, their top-of-the-head opinions and second, after they have had a chance to learn about the issue, its causes, various possible solutions, the costs, risks, and trade-offs associated with it, and about the specific areas that are marked by scientific/expert uncertainty or disagreement. The second set of views represents the public's more considered judgment. In general, a comparison between the first and second views may indicate whether the public is handling an issue with increased thoughtfulness and sophistication, and suggest the direction in which the public will move given a more thorough discussion of the issues.

Four hundred and two respondents from four cities -- Chicago, Hartford, Los Angeles, and Nashville -- were chosen to reflect a cross section of the noninstitutionalized, voting age population of the United States. During the period from September 25 to October 13, 1989, a group of respondents met in each city for a three-hour session.

Each Panel consisted of the following segments.

1. Panel members filled out a "pretest" questionnaire that asked them to rate the urgency of the two environmental issues among a list of national problems and to evaluate a wide variety of possible actions to deal with the issues.
2. Panel members next watched a fifteen minute video describing in a balanced way the issue of solid waste disposal and the four principal solutions to the problem (source reduction, recycling, incineration, and landfill), with pro and con arguments for each solution.
3. Panel members broke up into groups of about twelve to discuss the issue.

4. After a short break, panel members reconvened to watch a second video that presented the threat of global warming in a balanced way, went on to discuss what experts do and do not agree on, and described an assortment of proposals to reduce the buildup of greenhouse emissions, with the pros and cons of each proposal.
5. The panel broke up again into groups of about twelve people each to discuss the greenhouse effect for about forty-five minutes.
6. Finally, panel members filled out a "posttest" questionnaire in which they were asked the same questions contained in the pretest questionnaire.

In short, the project had the opportunity to examine respondents' views on solid waste disposal and possible global warming before and after they learned more about the issues, their causes, their possible effects, and the costs, trade offs, and sacrifices that were involved in their possible solutions. In analyzing the two sets of views, we focused on the types of changes that did and did not occur, the reason for the change, and what they revealed about the public's more general response to issues of scientific complexity.

As part of our analysis, we wanted to compare the views of the panel respondents with the views of leading scientists. How close together or far apart were the public and experts? We sent a lengthy questionnaire, using many of the same items asked of the panel respondents, to 1,620 of the country's leading scientists. Four hundred and eighteen scientists responded, a return rate of just under 26 percent.

These data, the findings of the Citizen Review Panels and the responses on the scientist's questionnaire, are the basis for the three volumes that comprise *Science and the Public*.

Volume I focus on the public's response to scientifically complex issues in general. It attempts to answer the question at the heart of the project: How does the public understand and analyze policy questions involving elements of scientific and technological complexity?

Volume II reports on findings related to the disposal of solid waste.

Volume III reports on views on the threat of global warming.

Preview

In this report, Volume I of *Science and the Public*, we draw on findings discussed more fully in Volumes II and III. Each of the other two volumes examines the public's responses to an environmental issue of scientific complexity -- the disposal of solid waste in Volume II and the threat of global warming caused by the greenhouse effect in Volume III. Those two volumes describe the public's responses to these two issues specifically. In Volume I we step back and take a broader perspective, and explore how the public deals with problems of scientific complexity in general. We consider such questions as:

- Can the general public understand and make thoughtful decisions about issues that are scientifically and technologically complex?
- Do people approach such issues differently than they approach concerns such as the economy? If so, in what respects and to what extent?
- How do people react to and resolve the issues of scientific uncertainty, when experts simply don't agree about the nature of a problem or its proposed solutions?
- How do people respond to the issue of risk?
- To what extent are the views of the public consistent or at odds with the thinking of the country's leading scientists?
- When do people defer to the experts and let them decide an issue that affects public life, and when do people insist on being involved?

From these perspectives, we have formulated eight hypotheses. So far as we know, these hypotheses (which remain to be tested in and of themselves) represent the most extensive, scientifically-based effort to describe the way public responds to issues of scientific or technological complexity.

Each of the first four hypotheses counters a common or stereotypical view of the public's relation to problems that center on science or technology. The second four deal with different aspects of the public's relation to science and the view of the public by political and scientific leaders. This second group suggests that the public's thinking on scientific issues often involves nonscientific considerations.

Hypotheses #1: Even scientifically complex issues about which there is substantial expert uncertainty can be thoughtfully considered and assessed by the public as a whole.

Many experts maintain that people simply do not have the knowledge or the capacity to assess complex scientific issues. Our findings do not support this view. The findings show that, for the public, scientifically complex issues are not, in their essence, different from the other pressing political and social issues that the public must decide. The point can be made most simply with one finding: After a brief period of study the views of our cross section of respondents were strikingly similar to the views of leading scientists.

Hypothesis #2: The lack of scientific knowledge is not what blocks the public from thoughtfully considering most highly scientific issues. Far more important than facts and figures is a framework within which the issue can be assessed.

Experts tend to argue that the reason most Americans do not make thoughtful decisions about scientific issues is because they do not know enough about science. Again, our findings did not support this assessment. We found that our cross section of respondents came to deeper understandings of the scientific issues at hand -- to outlooks that strikingly paralleled the outlooks of leading scientists -- once they understood the basic issues to be decided and the benefits and risks of alternative solutions. The ingredient the public needed was a framework of choices, not a greater accumulation of facts.

Hypothesis #3: A standard of "zero risk" is not necessary to win public confidence or assuage public concern about potentially dangerous scientific or technological ventures.

Some experts argue that the public wants science and technology to make sure that everything is risk-free, from drinking water to nuclear power plants to landfills. However, our cross section of respondents did not demand "zero risk." Indeed, most panel members were comfortable weighing risk against a variety of other factors, including costs, employment, and equity. If this finding is confirmed in other areas, it appears that many experts and elites have seriously overestimated the general public's presumed desire for a "zero-risk" world.

Hypothesis #4: Uncertainty among experts did not produce political gridlock. The public will not be paralyzed by uncertainty if certain conditions are met.

Some commentators speculate that disagreement among experts about highly scientific issues can cripple the public's ability to decide what to do about them. As a result, they argue, we increasingly reach "political gridlock" in which consensus seems impossible. However, most panel members were not paralyzed in the face of expert uncertainty, either about global warming or about the safety of incinerators. Our findings suggest that uncertainty among experts need not lead to gridlock if certain conditions are met, foremost among them being the explicit acknowledgement by a credible source that a problem does contain one or more components of scientific uncertainty.

Hypothesis #5: People deal with expert uncertainty by relating the uncertainty to their personal experience; however, such views can be tentative and subject to change given more persuasive evidence.

In the face of expert uncertainty, panel members made a pragmatic, case-by-case assessment based on their own experiences. For example, when asked whether incinerators pose an unacceptable level of danger to public health, many found the following facts to be persuasive: that for a number of years an incinerator had been operating in their community with no reports, so far as they knew, of any health problems; and that certain countries such as Japan and Sweden, widely admired for their science and technology, have used incinerators for a long time, again without reports of danger to public health.

Similarly, respondents pointed to the unusually hot summer of 1988 as legitimating scientific concern about the greenhouse effect, even though many scientists believe there is no connection. However, the panel's views drawing on their own experiences in unfamiliar territory are, understandably, tentative and subject to change. For example, a consensus among scientist that the greenhouse effect is in fact not a problem would have a great effect on people's thinking about the issue.

Hypothesis #6: While the public's judgment about scientifically complex issues will generally be in accord with the views of most scientists, public opposition to an unpopular option may not change, no matter how much technical information people receive.

Giving people a great deal of scientific or technical information will not necessarily change their thinking and make an unpopular proposal popular. The panel's opposition to nuclear power is an example. Experts often maintain that if only the public understood more about the threat of global warming and understood that nuclear power does not pollute or contribute to the greenhouse effect in any way, the public's views would favor more nuclear power. But this was not the case with our respondents, who were fully informed about nuclear power and its potential importance in reducing the buildup of greenhouse gas emissions. Opposition to nuclear power remained virtually unchanged, and seemed to rest on a combined emotional and intellectual assessment of many concerns, including the safe disposal of radioactive waste, the cost of nuclear power, and a lack of confidence in the people who design and manage the power plants and in the government's ability to regulate.

Hypothesis #7: Leaders may mistakenly attribute public opposition to proposals that they themselves support to a lack of public understanding about the "science" of an issue when the real cause has nothing to do with science or scientific uncertainty.

Elites may assume that the source of opposition to a seemingly wise proposal is the low level of public understanding about the science of an issue -- in other words, a poor grasp of the facts of the case. But our data show that the real reasons for public opposition may involve other factors that are essentially nonscientific. For our panel members, such factors included: the reluctance to raise taxes (necessary for some proposals to curb greenhouse emissions), concern about property values (and the not-in-my-backyard, NIMBY principle), and the history of an issue (many respondents felt that the history of nuclear power in the U.S. is replete with bad faith).

Hypothesis #8: The public's willingness to take the responsibility for dealing with a highly scientific issue will depend on a wide variety of factors, many of which are unrelated to science or the public's understanding of science.

As we explain in Volume II, our respondents were willing to put nearly all of the burden for dealing with the disposal of solid waste on the citizenry, on people like themselves. But with global warming, as we explain in Volume III, our respondents were inclined to look to others -- specifically business and industry -- to take the lead in reducing emissions contributing to the greenhouse effect. This difference can be attributed to many nonscientific factors, which include: the tangibility of the issue, the immediate severity of the problem, and perceptions about equity (everyone separating garbage is equitable, taxing people who need to drive great distances or use their cars, in their work is not).

Public Decision Making on Scientifically Complex Issues:

Eight Hypotheses

HYPOTHESIS #1:
Scientifically complex issues can be thoughtfully considered by the general public, even when there is substantial scientific uncertainty.

A primary goal of this study was to explore whether issues packed with scientific complexity and expert disagreement can be thoughtfully evaluated by the American people. Or, to put the question bluntly, are such issues too hard for most people?

- Are such issues, as some social scientists argue,[1] so complex that they can be intelligently assessed only by citizens who are scientifically "attentive," the roughly fifteen percent of the public who knows and cares more about science and science-related issues than most people do?
- Are these issue something that should not be on the public agenda at all, but rather something for elites to decide?
- Are such issues, because of their technical and scientific nature, qualitatively different from other problems studied by Public Agenda and the Kettering Foundation? If so, how, and to what extent?

We believe that while there are some fundamental distinctions which we will discuss, scientifically complex issues are not, in their essence, different from the other pressing issues we have examined such as the economy or education. There are four reasons why we reached this conclusion:

1. The panel's "considered judgment" about what to do about both issues (as expressed in the posttest) was remarkably similar to the views of the country's leading scientists (as determined by a survey of 418 of them).
2. The panel learned a great deal about the two issues, including what it needed to reach a reasonable, logical judgment about solutions, in a comparatively brief period of time.

3. The group's self-assessment shows that it thought it had learned a great deal.
4. The group's feeling that citizens have a right to be involved in deciding what to do about such issues, though often implicit, was unmistakably clear.

1. The panel's views were strikingly close to the views of the scientists.

When the opinions of the 418 leading scientists are compared to the panel's views, a remarkable pattern emerges: in the pretest, before the citizens learned more about the issue, there was a considerable gap between their thinking and the views of the scientists. But with both issues, the panel's posttest answers -- that is, its thought through, considered judgments -- were quite comparable to the views of the scientists.

In terms of solid waste, for example, both the panel in the posttest and the scientists favored a variety of measures, including mandatory, community-wide recycling in which a variety of incentives and penalties would be used to enhance compliance, source reduction (i.e., reducing the volume of solid waste by reducing packaging and disposable products), and, under certain conditions, building and using more incinerators. As for the threat of global warming, the panel (in the posttest) and the scientists agreed on nineteen of twenty-five proposals to reduce the buildup of greenhouse gases. That is, on each of nineteen different solutions, each with an explicit trade-off, a majority of the panel and a majority of the scientists agreed either to accept or reject it. The scientists favored only four proposals that the panel opposed.[2] (See Tables 1 through 6.)

2. The panel learned a great deal about the two issues.

In past studies, including work on the federal budget deficit, the nuclear arms race, and prison overcrowding among other issues, we have found that the American people often:

- have only an incomplete understanding of the issue;
- are misinformed about many key aspects; and
- are unaware of the policy options to address each issue, as well as the trade-offs of each option.

With these two issues, solid waste disposal and the threat of global warming from the greenhouse effect, we also found that many respondents misunderstood or were misinformed about the issues. However, by the end of the session, the number of panel members who understood the issue had sharply increased. For example, when asked what are the major causes of the greenhouse effect, the number answering correctly increased significantly. The number saying:

- the use of coal by utilities increased by 39 points (from 32 to 71 percent);
- people driving their cars, up by 28 points, (from 52 to 80 percent); and
- the destruction of tropical forests, up by 26 points (from 52 to 78 percent). (See Table 7.)

In addition, fewer people had incorrect notions. For example, the number saying that nuclear power plants are "not a cause at all" rose by 38 points, from 19 percent in the pretest to 57 percent in the posttest. Significantly higher numbers also said pesticides (35 percent, up from 15) and solar energy (83 percent, up from 68) are not a cause at all. (See Table 7.)

Solid waste was a more familiar issue. Each of our four sites has a serious solid waste problem, the issue has frequently been in the news, and many respondents were aware of it. However, evidence suggests that the group's understanding, while fairly high initially, also increased significantly. For example, the number saying they were "not sure" if they favored or opposed certain proposals to deal with solid waste decreased by as much as 20 percentage points. (See Table 8.)

3. The group's self-assessment.

At the very end of the second questionnaire, we asked respondents to indicate how much, if at all, their understanding of the two issues increased as a result of the session. With both solid waste and the greenhouse effect, 54 percent said their understanding had increased "a lot." Another large group (32 percent in the case of solid waste and 27 percent with the greenhouse effect) said their understanding had increased "somewhat." Only about one in ten said their understanding increased "a little," and even fewer (two and seven percent with solid waste and the greenhouse effect respectively) said their understanding "did not increase at all." (See Table 9.)

4. The group felt that citizens have a right to be involved in deciding what to do about such issues.

Perhaps as important as any statistic was the group's overall attitude toward the issues. Their responses suggest that not only did they have the ability to decide about such issues, they felt that they, and people like them, have the right, as citizens, to be involved and that such decisions should not be left to elites or even an attentive segment of the population. In addition to being involved in deciding about fundamental concerns such as locating an incinerator or landfill, numerous people expressed concern about the long-term environmental effects of what we are doing and the legacy we will leave our children and grandchildren. Compare people's reactions to one issue, the environment in a general sense, to another, the savings and loan crisis, some experts estimate that this problem will eventually cost the taxpayers up to 500 billion dollars. Yet at least to date, the public has been content to entrust the issue to experts and elites. But the public will not relinquish control of the environment, at least not in the foreseeable future. They will not stand by while an elite group of experts or even an "attentive" segment of the population decides what to do about that issue. Indeed, the environment in a general sense as well as particular environmental problems will be, almost without question, at or very near the top of the public agenda throughout the 1990s and into the next century.

HYPOTHESIS #2:

A lack of scientific knowledge is not necessarily what blocks the public from thoughtfully considering highly scientific issues. Providing a framework that includes choices for actions and the trade-offs for each is far more important than mere facts and figures.

In previous public opinion research, Public Agenda has learned that getting people to engage in discussion and then reach a thoughtful judgment about an issue requires something other than "more of the same." By that we mean that more information, more facts, more expertise, more technical understanding do not enable people to thoughtfully consider difficult issues.

In an earlier study, for example, in which we wanted to investigate public opinion about the future of US-Soviet relations and the nuclear arms race, we did not provide "more of the same." We did not give the respondents a lot of technical information, or discuss megatons, MIRVs and the MX. We did not describe the SALT agreements or the Helsinki Accords. Nor did we give them a history of the Cold War or a summary of various crises as a Public Television documentary might do.

Instead, our preliminary research suggested that the public's thinking was most inconsistent when it came to reconciling their long- and short-term views. To oversimplify, we found that when it came to the long term, most Americans held views that might characterize them as "Doves," while their short-term views would lead one to label them as "Hawks." And so we provided a cross section of nearly one thousand typical Americans with a carefully crafted framework developed by experts at the Center for Foreign Policy at Brown University in conjunction with public opinion and education experts at Public Agenda. The framework consisted of four radically different visions of the future of US-Soviet relations in the year 2010. Once people understood the framework, we worked backward, linking the four visions of the futures to various contemporary issues so that respondents could clearly see the tension between their short- and long-term desires. At that point, when they understood both the options and the trade-offs, panel members were able to discuss and, after a short period of time, thoughtfully decide:

- What kind of relationship the U.S. should have with the Soviet Union in the year 2010; and
- What steps we should and should not take to reach that goal.

In this study, we found what we have encountered with other issues -- that panel members were selectively informed about solid waste and the greenhouse effect. They often knew some facts, terms, events and names. But nearly all of them lacked an understanding of an overall framework like the one used by policy makers. They did not see the tension between choices, or the trade-offs, or the pros and cons of policy alternatives.

With these two issues then, we gave the panel a framework instead of "more of the same." We presented the issue within a structure that explained the policy options along with their pros and cons. To again oversimplify to make the point: some scientists believe that the reason why the American people do not make thoughtful decisions about scientific issues is because they don't know enough about science. And so, in the case of issues related to science and technology, such experts prescribe "more of the same," which in this case would involve increasing the level of scientific literacy among the general public through:

- more emphasis on science education in the public schools;
- more and better news coverage of science by the news media; and
- more shows like NOVA that help viewers understand science as well as what has been learned about a particular issue.

It is of course indisputable that increased scientific literacy is an important and desirable goal. However, scientific literacy would not seem to be directly related to the "choice work" required for anyone, citizens or elected officials, to decide what to do about issues that are scientifically complex. Ultimately, deciding what to do about the threat of global warming or the disposal of solid waste is not the responsibility of scientists or experts; it is the responsibility of policy makers who are advised by experts but who, with a few notable exceptions, are not experts themselves.

In numerous projects, we have learned that presenting complex issues to the general public may best be accomplished by preparing materials to be evaluated by someone who has what might be called the mentality of a corporate executive. Executives in major corporations are busy people with many things on their minds. And so, when making decisions, they often don't want to know the details of an issue or understand it in all its complexity. Rather, they want an issue stripped to its essence so that they can quickly learn what they need to in order to make a decision, nothing more.

In this study, we used this model to work with a cross section of typical citizens. Most Americans have only a limited amount of time to devote to current events, including even the most pressing national or local problems. And so, in order to get people to thoughtfully consider what to do about these two very complex issues, we boiled the issues down to their essence, and told people what they needed to know in order to make a well informed judgment, but no more. We did not try to stuff their heads with facts or information. For example, in terms of the threat of global warming:

1. We did not explain everything, including the chemical processes and reactions that make up the greenhouse effect.
2. We focused on only one of the greenhouse gases, carbon dioxide, and did not discuss the others.[3]
3. We focused on U.S. rather than world-wide emissions because we wanted to empower the group and make them feel the weight of the responsibility of wisely deciding what to do.
4. We avoided discussing certain energy sources such as hydroelectric power, wind, bio mass, and nuclear fusion that are likely to make only a modest contribution in the foreseeable future.[4]
5. We did not discuss related issues such as smog, acid rain and the depletion of the ozone layer, largely because of their complexity and interdependence.[5]
6. We presented only "mainstream" ideas to the panel.[6]

As for the disposal of solid waste:

1. We avoided discussing the costs of various disposal options,[7] and
2. We avoided the issue of whether a product was degradable.[8]

In an overall sense, we provided the panel with fewer facts and much less information about either issue than they would get from watching a typical NOVA program. We did not try to raise the panel's level of knowledge to that of most scientists, or even to the level of the most scientifically-minded of our citizens. Instead, we tried to give people what they needed to know, and nothing more. Our preliminary research on this subject along with our experience in explaining other complex issues to the general public led us to stress a number of facts about possible global warming, including the following:

1. Most greenhouse gases come from things we do every day, such as drive a car, use home heating oil, or buy electricity from a utility company that burns coal or oil;
2. There are no easy answers. Every proposal to reduce greenhouse gases has an accompanying sacrifice or trade-off;
3. There are no scapegoats or villains; the problem is caused by the way we live; and
4. While there are many aspects of the issues that scientists disagree about or don't yet know, the people we elect must decide what to do in the face of scientific uncertainty, and so could they.

In terms of solid waste, we stressed that:

1. Americans produce more solid waste than do people in any other country;
2. The issue is reaching crisis proportions because the cost of disposal is increasing sharply, and landfills in many metropolitan areas are rapidly filling up;
3. Source reduction and recycling cannot, by themselves, eliminate the need for other options, and that we will always need at least some landfill no matter how much we recycle; and
4. There are no easy answers. Recycling and source reduction will be very inconvenient, and using landfills and incinerators present certain risks.

Perhaps even more important than the information we provided was the way in which it was organized and presented. With both issues, we used a framework within which the issue could be understood, considered, discussed and assessed. Specifically, with the threat of global warming, we

- Briefly explained what the greenhouse effect was;
- Explained that there are many questions about this issue that scientists have not answered, including when or whether global warming might start and what its effects might be;
- Suggested there are no technological or miracle answers on the horizon;
- Explained that there are at least 25 proposals to reduce the emission of carbon dioxide, but that each has an accompanying sacrifice or trade-off;

- Described the options in a fair, balanced way; and then
- Asked the panel to decide.

With solid waste, we:

- Briefly described the problem and its increasing urgency;
- Presented four options for dealing with solid waste and discussed the pros and cons of each;
- Explained that there was a major area of scientific uncertainty, that scientists do not agree about the safety of incinerators;
- Described each option in a fair, balanced way; and then
- Asked the panel to decide.

In brief, we wanted to give them what they needed to know, and no more. We tried to put them into the shoes of a policy maker. To illustrate the point, consider how the disposal of solid waste looks to a community leader such as Nashville Mayor William Boner. His community is at a critical juncture: Nashville's landfills are nearly filled up, and he, in conjunction with other officials, must decide what to do with an enormous amount of solid waste. And they must decide within a framework of limited options. The Mayor will of course rely on experts for advice about the technical aspects of an issue, including the cost, risks, and trade-offs of various options. But the decisions he must ultimately make, after taking everything into consideration, are based on what he thinks is in the best interest of the community. His decision will ultimately be political in nature, not scientific or technical. Unlike scientific questions, which are theoretically testable, a political decision is a judgment based on values, not expertise. And because such a judgment is based on values and beliefs, it is unanswerable in a scientific sense and something about which reasonable people could disagree.

In the sessions, we asked panel members to imagine themselves as a Citizens Committee advising the President and the Congress, or the Mayor and the Governor. We likened their role to that of a jury, saying they were not expected to be experts and that the moderator and film would provide all the technical information they would need to know.[9] We repeatedly stressed that there were no right or wrong answers, and that we wanted their opinion. We made it clear that ultimately, after taking the technical information and the trade-offs into consideration, they, the panel members, were to decide what was best for their community and their country.

The results of this project suggest that a cross section of ordinary people can engage in a lively, thoughtful discussion about even the most scientifically complex issues and, within a comparatively brief period of time, arrive at a reasonable and logically consistent judgment about what their community or country ought to do.

HYPOTHESIS #3.
The general public does not expect a standard of "zero risk."

Public alarm about certain controversies, including the use of chemicals such as alar, red dye #2, and malathion, along with citizen opposition to nuclear power plants such as the one in Seabrook, New Hampshire, has led some policy makers and members of the scientific community to express concern about what they see as a demand for "zero risk." In their view, Americans overreact. The public, they fear, wants science and technology to make sure that everything is risk-free, including chemicals, drugs, drinking water and the blood supply as well as nuclear power plants, waste-to-energy incinerators, and landfills. The public, they fear, wants to live in a fantasy world in which science and high technology present absolutely no threat to public health and welfare. Some experts argue that these unrealistic expectations mean that business will increasingly be held accountable to standards that cannot be met and that public confidence in government regulatory agencies will steadily decline.

We asked the scientists whether they thought the public had realistic expectations about risk with regard to a list of potential threats. A majority said the public had unrealistic expectations about nuclear power plants (62 percent), the use of pesticides (51 percent), and how clean to make hazardous waste sites when they are cleaned up (50 percent). Large numbers also agreed or were not sure whether the public's expectations are realistic when it comes to birth control pills (38 percent saying they are unrealistic and 27 percent not sure) and vaccines for diseases like whooping cough (32 percent saying the public's expectations are unrealistic and 24 percent not sure). (See Table 10.)

We also asked the scientists what they thought of the public's views regarding solid waste incinerators. A near majority (43 percent) said the public's expectations about incinerator emissions were unrealistic while an additional 28 percent were not sure. Fewer than one in three (29 percent) said that in their opinion, the public had realistic expectations about the safety of incinerators. Only with the safety of the blood supply and the purity of ordinary drinking water did a majority (57 percent in both cases) say the public's expectations were realistic. (See Table 10.)

However in the posttest, the panel, a cross section of 402 people chosen to represent the country as a whole, did not demand "zero risk," a result suggesting that the public's desire for a risk-free world may be overestimated, and perhaps even seriously overestimated, by many scientists and experts. Comments in the discussion suggest that panel members were able to comfortably weigh risk against a variety of other factors, including cost, job loss, and equity.

The panel's support for building incinerators increased sharply from the pretest to the posttest. We asked the identical question each time, with the trade-off being "some scientists say they pose a danger to the public." The panel's initial reaction was to pause, with only 36 percent in favor and a huge number, 31 percent, not sure. Additionally, in the film and in the discussion we informed the panel that some scientists[10]• say incinerators "pose a danger to the public." As the panel members considered the views of the three groups of scientists and heard various arguments, pro and con, they worked through the issue and their opinions changed, with many more saying they favored building incinerators in the posttest. Finally and perhaps most important, the panel's increased support for using incinerators after the intervention implicitly establishes that it did not demand a standard of "zero risk," at least in this particular case. (See Table 11.)

However, while the group felt that the evidence to date suggests that incinerators do not present a clear and present danger to public health, neither did it dismiss the possibility. Instead, it wanted to minimize such risk by insisting that incinerators:

- be built using state-of-the-art technology to protect the environment;
- be inspected and monitored regularly by government environmental officials; and
- be located away from populated areas, in part because of aesthetics but also because fewer people would be in danger if there were a threat to health.

When those three conditions were met, large percentages in the group felt that building new incinerators was an idea they favored and, implicitly, a risk they were willing to take.

On a variety of other issues too, comments by panel members in the discussion made it clear that they understood there was no such thing as a risk-free world. In fact, many panel members said it is scientists who are alarmists, the ones likely to cry wolf. The group was given a pair of statements and in the posttest, 50 percent agreed that scientists are "a reliable and trustworthy source of information." However, a very large minority, 37 percent, felt that "scientists often exaggerate the problems and dangers we face." And the rest, 13 percent, were not sure. In fact, there was a nine point increase in the number saying scientists exaggerate from the pretest to the posttest.[11] (See Table 12.)

At the same time, there were other cases where the panel expressed what many would say is too much faith in science and technology. For example, large numbers felt that solar energy would soon be developed and that auto makers could "easily" improve the miles-per-gallon standard to 40 or even 50 mpg by the year 2000. In effect, large numbers believed that "science and technology" would solve the problem of the greenhouse effect painlessly.

But in sum, there was confidence in scientists. By a margin of more than two to one (52 to 23 percent), the panel agreed that scientists are "very open-minded and willing to consider any new idea, no matter how far-fetched it may seem, as long as it can be tested using the scientific method." It was also clear that panel members implicitly saw science as the accumulation of a body of knowledge since, for example, they felt that any uncertainty was temporary and that experts would eventually reach consensus through the accumulation of data and testing using the scientific method.[12] (See Table 13.)

Finally, we asked the panel members what they believed in. While 73 percent said they thought the theory of relativity was true, 36 percent also believed in astrology and 33 percent believed that the theory of evolution is false. Together then, all the results suggest that the panel gave science and scientists a vote of confidence but not a ringing endorsement. (See Table 14.)

HYPOTHESIS #4:
Uncertainty among experts need not produce political gridlock. The public debate need not be paralyzed by scientific uncertainty.

Many commentators have speculated that disagreement among experts about highly scientific issues can cripple the public's ability to decide. Examples might include the use of certain pesticides which some scientists say are safe to use while others disagree. Artificial life maintenance, nuclear power, and genetic engineering would seem to be other examples. In each case, disagreements among experts are, if not causal, certainly consistent with schisms in public opinion. As a result, these commentators say, we increasingly reach what could be called "political gridlock" in which issues cannot be resolved and consensus cannot be reached, largely because public opinion is contradictory, inconsistent, fragmented and divided. When the public speaks with many voices, it is more likely that noise from the special interests will drown out the body politic.

Even our own initial thinking was influenced by these views. In the early stages of this project, we suspected that scientific issues may be fundamentally different from other issues and that, in the face of expert uncertainty, most people would be unable to decide on a course of action. However, data from this study do not substantiate the hypothesis, at least as originally formulated. Uncertainty or disagreement among scientists and experts need not lead to gridlock if certain conditions are met.

To us, one of the most important findings of the research was that so many panel members were not paralyzed in the face of expert uncertainty, either about global warming or about the safety of incinerators. Most were able to decide rather easily what should and should not be done about both.

Indeed, in terms of the threat of global warming, scientific uncertainty had the opposite effect; instead of paralyzing the panel, the uncertainty prompted them to call for action. As we discuss in detail in a companion report,[13] many respondents argued that in view of the uncertainty -- including when, if ever, global warming would begin and what effects it would have -- we should act now to reduce the buildup of greenhouse gases for various reasons, the most important being a "better safe than sorry" rationale.

We believe the reason for this outcome stems from the way in which the uncertainty was presented. Our preliminary research suggested that people often feel accosted by raw, random and conflicting expert opinion. We wanted to shield people from that. Therefore, in the film and in the discussion we acknowledged that uncertainty exists. Uncertainty, we suggested, is a given, a fact of life. We suggested that it was akin to the proposals with which there was always a trade-off, always a sacrifice by someone or a cost to be passed along to somebody somewhere.

To understand our approach, consider the following analogy. Patient A asks a doctor whether a certain treatment that is both expensive and risky will relieve a painful symptom. The doctor strongly recommends the treatment, but Patient A decides to get a second opinion. The second doctor strongly opposes the treatment, saying it would not relieve the painful symptom and might even worsen it. In such a case, it's easy to imagine Patient A becoming frustrated and unable to decide what to do, running from doctor to doctor trying to establish some semblance of a consensus in which most of the doctors feel one way or the other or deciding which doctor to trust. To the extent that scientifically complex issues are presented in a similar fashion, "expert uncertainty" may very well make it impossible for the public to decide what to do about an issue, the result of which might be gridlock.

Next, consider Patient B who is in a nearly identical situation and whose doctor said, "Medical science is not certain yet. Most doctors would say get the treatment, a minority would say don't, and a fair number just aren't sure which view is correct. We simply don't have an answer to that question yet. We're not certain whether the treatment is a good idea or not. And so the decision about whether or not to proceed is up to you. Now, here are the possible risks and benefits." Patient B might react very differently; instead of being intellectually immobilized, B has been empowered and given the responsibility to decide. Patient B is able to accept the uncertainty because telling people about uncertainty may not reduce their confidence in scientists or doctors. It may in fact have the opposite effect.

A key difference in these cases is that Patient A was, in effect, being asked to decide which expert is correct. Patient A had to judge whose advice to follow -- a question that, by definition, required A to be an expert in order to answer. Of course Patient A could have flipped a coin, or decided which doctor was nicer, or used a variety of criteria unrelated to the treatment to decide. But to make a reasonable, informed choice, Patient A had to decide which doctor was correct, the one who said the treatment was necessary or the one who said it wasn't. And so we draw this conclusion: When people are inundated by unfiltered and conflicting expert opinion, especially about unfamiliar issues that are very scientifically complex, they may well end up unable to decide. Or, and perhaps more likely, their decisions may be inconsistent and volatile, and swing wildly from one extreme to another on the basis of scant information.

But in the second case, the physician explained the limits of what is known and unknown, saying that many things about the issue are simply unknowable at the present time. There is virtually no one who can say with certainty that the treatment is or is not necessary, experts disagree with each other, many are simply not sure. In this case, Patient B is being asked to make a judgment based, not upon technical expertise, but upon a wide variety of criteria and values such as: "How much risk am I willing to take? How badly do I want to alleviate the symptoms? How expensive is the procedure? Is this a convenient time or should I wait a while to see if things clarify themselves?"

While Patient A might also ask such questions, the decision would ultimately be based on which expert was believed. But Patient B was not asked to sort through what the experts think, but to sort through the pros and cons, and decide what to do with less than perfect knowledge -- which is something that, in different contexts with other issues, all of us do all the time. The effects, costs, and benefits of many policy initiatives are something about which experts may not agree and often much is unknown. President Bush's views about providing cost-effective health care for the elderly may be very different from Senator Ted Kennedy's views. And both men have experts advising them. The difference ultimately is one of values, not expertise.

Another difference between the cases involves the patient's relationship to the experts. It's easy to imagine Patient A being bounced from doctor to doctor, receiving unfiltered advice from one expert after another. But with Patient B, a credible source, the physician, stepped back and summarized the entirety of experts' thinking, including its extent and limits. Patient B had a guide who led the way through a maze of expert disagreement, summarizing what was and was not known. Finally, we should stress that Patient B's decision may turn out to be incorrect. Indeed, many policy decisions are, in hindsight, unwise. But people's ability to decide can be enhanced by the way in which expert opinion is delivered.

The panels were structured so that the uncertainty resembled the case of Patient B. The panel was told that:

- Scientists and experts do not always agree about these issues, that especially when it comes to the danger posed by incinerators or the likely extent of global warming, a minority feels one way while a majority feels the other way.
- There are a "fair number" of scientists and experts who simply aren't sure which view is correct and who acknowledge that fact.
- The disagreement about these two issues was similar to one that people are familiar with: the disagreement among doctors about the danger of eating red meat and sugar. The moderator told the group that a minority of doctors says: "Don't eat any red meat and sugar. They are not good for you." But that most doctors would say, "It's all right to eat meat and sugar, at least in moderation." And that a fair number of doctors simply are not sure which view is correct.
- There are limits to the extent of the uncertainty; the panel was assured that with regard to both issues, there are many things about which experts do agree and are sure about, many of which were spelled out.

This final point may be crucial. That is, never did we ask the group to disregard experts or expertise. We did not tell them that experts were of no help or that seeking advice of experts was a waste of time. Never did we say, as one respondent did, that "everything causes cancer," (i.e., that experts are either alarmists, or so confused about things that they cannot be relied on, or both.) We did not ask panel members to suspend their world view or change their thinking entirely. We suggested that in terms of these two issues, scientists might reach a consensus in the not too distant future, and that the uncertainty may be only temporary. But at this time, we said, experts simply are not sure; they don't know yet.

Another thought should be mentioned. When considering science-related issues, people rely more heavily on experts and expert evidence than they do with most other issues. Therefore, in presenting such issues to the public, the credibility of the messenger is also important.

By way of comparison, most people comfortably decide a variety of issues without seeking expert advice, and sometimes decide contrary to expert opinion. For example, the American people favor the use of capital punishment. The number in favor has increased steadily over the past twenty-five years and now exceeds 80 percent. In this case, the public may ignore experts who argue that capital punishment is not a deterrent because most murders are unpremeditated, and the victim is usually a friend or family member. With a great many issues, including whether a city should hire more police officers, or raise teachers' salaries, or build a new bridge, or pave a road, the public may give little or no consideration to the views of experts. Even about spending on such high technology issues as SDI or the B2 bomber, most people can answer without relying on experts. In some of these cases, people may consider expert opinion; in others, they may give it a passing glance; and in some, such as capital punishment, they may dismiss expert opinion altogether.

In sum, the panel was not immobilized when they learned about the nature and extent of expert uncertainty regarding the buildup of greenhouse gases or the safety of incinerators. In general, the panel's respect for scientists and other expert did not decrease. In both cases, respondents were able to weigh various considerations and reach a judgment. However, our research suggests that as many as six conditions may be necessary in order for people to deal with expert uncertainty:

1. Uncertainty must be acknowledged;
2. People must learn about expert uncertainty through a credible source, ideally from the experts themselves;
3. People must understand that uncertainty is limited, and what those limits are;
4. People must understand the areas of expert uncertainty within the broader framework of the issue;
5. People must know how the uncertainty relates to each option to address the issue, including the possible risks and benefits of each; and
6. People need time to deliberate, to consider the areas of expert disagreement, including the possible consequences of putting off a decision until uncertainty is eliminated, and "work through" their feelings about these issues.

HYPOTHESIS #5:
People often relate considerations about risk and expert uncertainty to their own personal experience.

In Hypothesis #2 above, we discussed the kind of framework necessary for citizens to avoid becoming intellectually paralyzed by expert uncertainty. Here we generalize about exactly how the panel, in the face of such uncertainty, managed to decide what to do.

In the face of expert uncertainty, panel members made a pragmatic, case-by-case assessment based on their own experiences, comparing their experience to different expert perspectives. For example, when asked whether incinerators pose an unacceptable level of danger to public health, many found the following facts to be persuasive:

- That for a number of years an incinerator had been operating in their community with no reports (that they knew about) of it causing public health problems; and
- That certain countries such as Japan and Sweden, which are widely admired for their science and technology, have used incinerators for a long time, again without reports of danger to public health.

That is, most group members felt that, counting other countries and their own community, there was enough accumulated evidence for them to make a judgment.

Compare the result about incinerators to the group's assessment of nuclear power plants. Here the same two facts (that many communities have relied on nuclear power for years, and that many other countries including Japan and France use nuclear power extensively) were not enough to persuade a majority of the panel. Other experiences, such as the accidents at Three Mile Island and Chernobyl, and concern about the safe disposal of radioactive waste overwhelmed all other considerations.

Those who opposed incinerators also drew on their own experience. Some mentioned problems of odor and fly ash. "Have you ever smelled the ash that comes out of an incinerator?" a Nashville area woman asked. "It smells awful. It can't possibly do the environment any good."

And a few questioned the judgment of "most scientists and experts," saying they would rather play it safe, and give the benefit of the doubt to those calling attention to the danger. A man from the Los Angeles area said, "We've been led down the garden path too many times by those so-called scientists and we find out later on. They told us that nuclear power plants were very safe and nothing could go wrong with them -- now we find all kinds of faults with them."

In the face of uncertainty about possible global warming, many again drew on their own experience and used it as the basis for their view. For example, many said they believed in the threat of global warming because, in their view, the weather had already changed, winters were milder than they used to be and summers were hotter. In the posttest, 73 percent of the panel said they thought that global warming caused by the greenhouse effect has already started as compared to 40 percent of the leading scientists. (See Table 15.)

But in some of these cases, we should stress that the panel's views about these issues did not seem to be what we would call a stable, considered judgment; rather, many of their views were tentative assessments made, absent expert consensus, on the basis of the panel member's own sense and experience. If new evidence were to indicate that incinerators do indeed present a danger to public health or that there really is no real threat of global warming, the panel's (and the general public's) views would quickly shift.

HYPOTHESIS #6:

Most of the time, the public's considered judgments about scientifically complex issues will be in general accord with the views of most scientists. However, public opposition to a particular option may not change, no matter how much technical information people receive.

In our discussion of Hypothesis #1, we show that the panel's posttest results were quite consistent with the views of the scientists; we also speculate that this outcome may be repeated (as long as certain conditions are met) on a variety of scientific issues because the choices are ultimately values-based, not scientific or technical. In our discussion of Hypothesis #3, we argue that to enable people to understand these issues, a framework is more important than facts, and that mastery of scientific or technical information would seem to be neither necessary nor sufficient for people to make a reasonable, logically consistent judgment about them.

A related observation is that giving people a great deal of scientific or technical information will not necessarily change their thinking and make an unpopular proposal popular. Take as an example nuclear power. The leading scientists tended to be strong advocates of nuclear power.[14] More than two-thirds (68 percent) said we should build more nuclear power plants to reduce our use of fossil fuel and thus reduce the emission of greenhouse gases. Experts might be tempted to think that if only the public were scientifically literate, if only they understood more about the threat of global warming and that nuclear power does not pollute or contribute to the greenhouse effect in any way, the public would feel same way; if the American people had a clearer understanding, they, like the scientists, would change their minds and favor using more nuclear power. (See Table 16.)

In the film and again in the discussion, we clearly explained the benefits of using nuclear power in relation to the threat of global warming. And support for building more nuclear power plants did increase by 9 points, from 36 percent in favor in the pretest to 45 percent in favor in the posttest. However, and most importantly, the number in opposition did not change. In the pretest, 45 percent were opposed to building more nuclear power plants and in the posttest, 46 percent were opposed. Virtually all of the increase in support came from respondents who were initially not sure. (See Table 16.)

In addition, there was no evidence to suggest that the more educated respondents favored nuclear power more than the less educated. In the posttest, 50 percent of the respondents with a college education wanted to build more nuclear power plants compared to 46 percent of those with a high school degree or less. (See Table 17.)

In the case of nuclear power, we also learned that misinformation was probably not an important factor; the fact that numerous respondents were misinformed about key aspects did not seem to be crucial. In the discussions a number of people said they were afraid that a nuclear power plant could "explode" like a nuclear bomb. But when the moderator told them this was impossible, that it could not happen, group members did not seem reassured.

They did not seem to doubt the moderator; rather, it seemed as if their opposition was due to an accumulation of concerns and rooted in an emotional as well as an intellectual assessment that was based on concern about the safe disposal of radioactive waste, the threat of a meltdown, the level of confidence panel members had in those who design, build and manage such facilities, the cost of nuclear power, and the faith they had in the government's regulatory ability. In many cases then, concern about a possible explosion was merely one of a series of attitudes underlying their views.

Another notable area where the scientists differed from the panel involved a tax on "gas guzzlers," cars that get poor gas mileage. Among the scientists, 75 percent were in favor. While support was much broader among better educated respondents (46 percent of those with a college degree favored this tax compared to only 27 percent of those with a high school education or less) a majority in both groups opposed the tax. In addition, the number of panel members in favor of this proposal actually decreased from the pretest to the posttest, with 42 percent in favor initially and 37 percent in favor after learning how auto emissions contribute to the buildup of greenhouse gases. (See Table 16 and 18.)

The scientists also endorsed a 25 cents a gallon increase in the gasoline tax. Many advocates of this measure argue that increasing the gasoline tax would simultaneously reduce the budget deficit, reduce our dependence on foreign oil, reduce smog and air pollution in addition to reducing the emission of greenhouse gases. But the panel would hear none of it. In the posttest, only 11 percent were in favor of this step. (See Table 16.)

However, in another area, the differences between the two groups might easily be overestimated. In several cases, the differences between the two groups were not about policy, or goals or an assessment of a proposal. Instead, it was based on a difference in judgment about how to enact the policy. Especially with solid waste but also with possible global warming, the scientists were far more likely to favor using taxes and incentives, while the panel was more inclined to favor regulations. But though the two groups preferred different strategies (e.g., incentives versus regulations) both groups wanted to achieve most the same goals to about the same degree.

To further align the panel's views with those of the scientists may have meant teaching them about economics and the elasticity of demand, and persuading them that incentives are a more cost-effective way to enact policy than regulations. It may not have required instructing the panel about scientific matters related to either issue. This crucial distinction is the difference between understanding the science of an issue (which the panel did) as opposed to the mechanism by which the issue is addressed. The fact that the scientists undoubtedly had a more sophisticated understanding of economics does not necessarily mean that they and the panel were at odds about which proposals to endorse.

HYPOTHESIS #7:
Leaders often mistakenly attribute public opposition to a favorite solution to a lack of scientific knowledge when the real cause has nothing to do with science.

In our preliminary research, we explored a number of issues where the uncertainty of experts seemed to hamper people's ability to make a decision. But we also found that there are times when the cause of gridlock may be misunderstood. Elites may assume that the cause of gridlock is scientific complexity or the low level of public understanding about the science of an issue; but in fact, they may not be the real cause at all. The real reasons for public opposition may involve other factors that are at play with many nonscientific issues as well as scientifically complex ones.

A Solution's Effectiveness: In one discussion after another, respondents said that economic incentives and penalties would not work, that people would still use the same amount of gasoline, even if the gas tax were increased. Or they would continue using disposable products such as paper plates, diapers, and plastic pens and razors, even if their price increased because of a tax. For the most part, the panel simply did not think that economic incentives and penalties would be effective. To a certain extent, their views were an obvious rationalization and a contradiction of recent history in which consumer preferences have indisputably been affected by rising prices.

However, the group was more inclined to favor regulation for another reason: it was felt to be more fair. Regulations do not enable those with the most money to avoid the sacrifice simply by paying more for something. Regulations affect everyone equally. But whatever the reasons, opposition to using taxes seemed to have more to do with taxes than about the panel's understanding of possible global warming. And so to change people's thinking about the comparative benefits of taxation versus regulation would seem to require improving the public's understanding of basic economics, not science.

A History of Bad Faith: In the opinion of many respondents, the history of nuclear power in the U.S. is replete with bad faith. More than one panel member talked about how they once believed that nuclear power was safe but now felt that they were misled. Therefore, much of the opposition to nuclear power may have nothing to do with the public's understanding of the threat of global warming or of their understanding about nuclear power. Opposition from many panel members seemed to stem from deeply felt beliefs that, whether objectively true or not, have a reality and effect of their own.

The NIMBY Factor (Not In My Back Yard): The source of people's opposition to a proposed incinerator or landfill may have nothing to do with their understanding of solid waste and the need for more disposal options. We should also keep in mind that the NIMBY factor may be much more than a selfish wish to avoid any unpleasantness. Property values and quality of life may be seriously altered if an incinerator or landfill is situated near where they live.

The Reluctance to Raise Taxes: Even though a number of measures that would mean a tax increase were approved by a majority, the prevailing sentiment in this country at this time is that taxes should not be increased. Indeed, President Bush made his "No new taxes" pledge a cornerstone of his campaign. And so even if Americans fully understand the relationship of the automobile to both the greenhouse effect and smog, most will probably continue to oppose even an incremental gasoline tax increase.

HYPOTHESIS #8:
The public's willingness to deal realistically with a highly scientific issue depends on a variety of factors, many of which are unrelated to science or the public's understanding of science.

In our discussion of Hypothesis #1, we show that when the opinions of the 418 leading scientists are compared to the panel's views, a remarkable pattern emerges: in the pretest, there is a considerable gap between the panel's thinking and the views of the scientists. But with both issues, the panel's posttest answers -- that is, their thought through, considered judgments -- were generally in accord with the views of the scientists.

However, as we also note in each of the two volumes, there are significant differences between the panel's views about the two issues.[15] One key difference is that when it came to solid waste, the panel was willing to put nearly all of the burden of sacrifice for dealing with the issue on the citizenry, on people like themselves. The panel's prescription was that we all must sort our garbage, we all take hazardous wastes to a drop-off center, we all pay more for returnable bottles and cans, and we all are inconvenienced by having fewer disposable products.

But with global warming, the panel, though willing to make some sacrifices in an overall sense, was more inclined to look to business and industry to take the lead in reducing emissions contributing to the greenhouse effect. That is, while the panel's thinking was generally in line with the views of the 418 scientists, there was a pattern to the difference -- even in the posttest, the panel was more inclined to look to business and industry while the scientists tended to spread the burden of sacrifice across the population.

Specifically, the scientists favored four measures that the panel opposed:

- a 25 cents a gallon tax on gasoline;
- a tax on gas guzzlers;
- more nuclear power; and
- aid to Brazil if they stop destroying tropical forests.

The panel favored two measures that most scientists did not:

- increasing the mpg standard for new cars to 50 mpg by the year 2000, a proposal that the panel felt would put the burden on auto makers, even though the trade-off was to "sharply increase the price of new cars and decrease the performance of full-size cars and station wagons;" and
- reimposing and strictly enforcing a nationwide speed limit of 55 mph.

Like all highly scientific or technological issues, solid waste disposal and the threat of global warming have distinctive elements and characteristics that, in turn, affect the public's thinking about them. Below we examine some of those characteristics that seem to be related to the differences between the views of the panel as expressed in the posttest and the views of the 418 scientists.[16]

1. The Tangible Nature of the Issue: Some years ago, in response to a drought condition in the western states, the people of those states responded magnificently to an appeal from the governor and worked together for months to conserve water. Public opinion analyst Daniel Yankelovich said the incident was a marvelous example of the public's response when people understand that a problem is undeniable and that no one is to blame; the drought was not caused by bureaucratic waste or government inefficiency; the problem was not due to collusion among the oil companies or auto makers; there was no fleet of oil tankers offshore, waiting for prices to rise, or technology being deliberately kept off the market. People could see that it had not rained; the issue was tangible and undeniable; and therefore they were willing to pitch in and sacrifice to help their community manage as best it could.

Of course many problems, both scientific and nonscientific, are not so tangible. And if the citizenry has low confidence in its institutions, including the news media (as the public does), and low regard for its elected officials and governmental institutions (as the public also does), they are likely to consider whatever they hear through a filter of cynicism.

- Yes, the schools aren't doing a good enough job, people may say, but the problem is not financial, it's administrative.
- Yes, the budget deficit is too large, they may say, but the answer is not to raise taxes or cut spending, it's to eliminate waste, fraud and abuse.

- Yes, there's too much crime, they may say, but the problem is not a clogged criminal justice system and a shortage of police, judges, probation officers and prison cells along with the perpetuation of an economically-deprived and culturally-isolated group of people -- the problem is that judges aren't tough enough.

Imagine rating how tangible the panel felt each issue was using a scale of 1 to 10, where 10 means "very high" and 1 means "very low." Solid waste would receive a very high rating, probably an 8 or a 9. Panel members knew a lot about it before the session began; they understood that the trash they create everyday is the essence of the problem; and so, as with the example of the drought, they were willing to roll up their sleeves and pitch in, and sacrifice for the common good.

On that same scale, however, the threat of global warming would get a lower rating, perhaps a 5 or 6. Though a fair number of panel members said they thought global warming has begun, they did not have a clear idea about what it might lead to, what its effects might be or when those effects might be felt. In addition, many confused the issue of global warming with a variety of other issues, including the energy crisis and this country's dependence on foreign oil, and a variety of air quality issues such as smog, acid rain, and the depletion of the ozone layer.

2. The Diagnosis of the Problem: While the issue of solid waste poses serious but essentially moderate risks, the threat of global warming from the greenhouse effect has the potential to be catastrophic. One might therefore conclude that the public's willingness to sacrifice would be directly related to the magnitude of the risk. However, our results suggest the contrary: the panel felt an urgent need to deal with solid waste, but not with the threat of global warming.

Importantly, however, the panel's forecast of the effects of global warming over the next few decades was essentially moderate.[17] Most panel members felt that global warming would not have catastrophic consequences until about well into the next century; as a result, they felt there was no compelling reason to dramatically change our lifestyle overnight. Therefore, the immediacy of a problem as well as its magnitude would seem to be an important factor in capturing public attention and causing people to deal with it realistically and in terms of the common good.

3. Understanding the Issue, Especially Within a Choices Framework: In each site, and especially Nashville, solid waste had been a subject of recent controversy and was often in the news; as a result, many respondents had a fairly clear understanding about the dimensions of the problem as well as other aspects of the issue much of it before the intervention. They knew a good deal about the issue, including that their community had a serious problem, when they came in the door.

However, the panel had much less prior knowledge about the greenhouse effect. While awareness of the term was high, most did not understand the nature of the problem, its causes, or its possible solutions. And of course virtually no one understood the scientific uncertainty surrounding the issue.

In the solid waste intervention then, there was far less new information to communicate. While we provided a framework, we only had to explain two aspects in detail: source reduction and incineration, and especially the expert uncertainty about the safety of the latter. Most had a clear understanding of recycling and knew at least a fair amount about landfills.

On a scale of complexity, with 10 being "very complex" and 1 being "very simple," solid waste might warrant a 3 or 4 while the greenhouse effect would get a 10. Indeed, it is hard to imagine a national issue that is more complex and multi-faceted. And so it is not surprising that even after the intervention, panel members understood solid waste better than they understood the greenhouse effect.

4. Scapegoats and Wishful Thinking: With regard to solid waste, the panel did not deny the existence of the problem, or look for a scapegoat, or expect a "technological breakthrough" (i.e., miracle answer) that would solve the problem painlessly. Rather, most felt that the problem is a function of the way we live, a result of our lifestyle, that we have become a "throw-away society." Therefore the panel felt that most of the burden for dealing with the problem should fall on the citizenry, on people like themselves.[18] In the pretest, before learning more about the issue, a majority of the panel favored nine separate proposals to deal with solid waste, including mandatory recycling that would require people to separate their garbage (favored by 90 percent). (See Table 1.)

However, with the greenhouse effect, we encountered a fair amount of wishful thinking, even after the intervention. For example even in the posttest, 64 percent agreed that if most businesses and industries would take a "small cut in profits," they could "easily eliminate most pollution and other emissions contributing to the greenhouse effect." In the discussions, many said that auto makers could "easily" make cars that get better gasoline mileage "if they really wanted to." And a large minority, 41 percent, also agreed that the reason we don't now use more solar energy is because "the big oil companies are trying to block the development of solar energy to protect their profits." Indeed, the panel was perhaps unduly optimistic about solar energy, with a near majority, 47 percent, saying that solar energy will be able to provide at least 20 percent of the country's energy by the year 2025.[19] (See Tables 19, 20 and 21.)

5. Perceptions About Equity: "Justice must not only be fair," wrote Oliver Wendell Holmes, "it must also seem to be fair." In discussing the two issues, and especially the threat of global warming where some of the trade-offs were quite difficult, panel members expressed great concern about fairness. They wanted any sacrifice to fall equitably on different groups of people and segments of society, including business and industry. Given the group's underlying beliefs about profits and oil companies "blocking" the development of solar energy, this feeling was especially pronounced with global warming. With solid waste, there was less concern about fairness since everyone would be required to sort their trash. But even there, a number of people fretted that tax incentives or requirements be spread equitably throughout the population.

People need to see an array of solutions along with the pros and cons of each. Decision-making was facilitated by the group's ability to see a range of proposals which enabled them to assess what might be required of various groups or social sectors, including people like themselves. Helping people see that any sacrifice will be broadly shared and not fall only on their shoulders will increase their willingness to accept trade-offs and costs.

6. The Nature of the Sacrifice: Finally of course the public's willingness to sacrifice to deal with a problem depends to a considerable extent on the nature of the trade-offs. While the solid waste trade-offs were not painless, neither did they involve a radical change in people's lifestyle. But some of the greenhouse measures would require just that. Two of the most unpopular proposals were gasoline rationing and raising the gasoline tax. In fact, there was actually more support for banning cars that get poor gas mileage (25 percent) than there was for the proposals to raise the gasoline tax (supported by 11 percent each). In large part, the panel's views reflected much more than the proverbial "love affair" Americans have with the automobile; the panel did not see driving as a discretionary activity, as something that people could easily cut back on. Rather the panel felt that using the automobile was a necessity, and therefore something where the cost should be kept as low as possible. The other proposal that was overwhelmingly rejected -- also a clear hardship -- would have required people to keep their thermostats no higher than at 65 degrees. (See Tables 4, 5, and 6.)

Notes

1 For example, Dr. Jon Miller of Norther Illinois University has argued in a variety of publications and forums, including *Science Indicators* published by the National Science Foundation and at a symposium in Woods Hole, that since most Americans have little understanding of or interest in issues involving science and technology, only an "attentive" segment (about 15 percent characterized by high knowledge of and interest in science and technology), is able to thoughtfully assess issues that are scientifically or technologically complex.

2 Most of the panel, but not a majority of the scientists, favored the other two proposals.

3 Carbon dioxide currently is responsible for about fifty percent of global warming. Not only is it the biggest source, carbon dioxide is also an otherwise harmless gas that is generated from familiar sources and is not already subject to regulation or a treaty as other greenhouse gases, such as chlorofluorocarbons, are. For these reasons, we focused only on carbon dioxide and not on the other greenhouse gases.

4 We also decided to avoid discussing nuclear fusion, in large part because or 418 leading scientists were not terribly optimistic about it. Only 21 percent said that fusion will contribute at least five percent of the world's energy needs by the year 2025.

5 For example, automobile exhaust contributes to smog and the greenhouse effect, but not to acid rain or depletion of the ozone layer. Burning high sulfur coal contributes to smog, the buildup of greenhouse gases, smog and acid rain, but not to the depletion of the ozone layer. Certain refrigerants and propellants are both greenhouse gases and destroying the ozone layer, but do not cause smog or acid rain. The entire nexus of issues was too complicated in half of a three hour session (the other half being devoted to solid waste).

6 For example, we did not tell them about the handful of scientists who speculate that a certain algae will proliferate and then absorb tremendous amounts of carbon dioxide thus "solving" the problem painlessly.

7 Our preliminary research suggested that there was tremendous variation on the cost of each option, and especially on the cost of incinerators and landfills, depending on the price of land, the cost of labor, the size of the facility, etc.

8 There were times during the discussion when partial knowledge actually hindered respondents as they struggled with the issues. Panel members sometimes used technical terms without fully understanding how such terms relate to the framework under consideration. For example, a number of people freely used the term "biodegradable" during the discussion about solid waste, but incorrectly assumed that using biodegradable products would substantially alleviate the problem. Some found it hard to understand that whether or not waste is biodegradable is inconsequential in terms of the volume to be disposed of, and thus essentially irrelevant, at least as the issue confronts policy makers over the nest five to ten years.

9 The difference between the panel's responsibility and a jury's of course is that the panel was not to confer or try to reach consensus; rather, panel members were expected to reflect on both issues and indicate their personal preferences.

10 In the film and in the discussion, we said that a few scientists say incinerators are very dangerous, most say that a "well run incinerator is pretty safe," and that "a fair number" aren't sure which view is correct. For a complete description of how we arrived at such a breakdown, see *Science and the Public: Volume II: The Disposal of Solid Waste.*

11 We believe there are two reasons for the change: first, we talked a great deal about risk and, in effect told the group that with both issues, some scientists are alarmed; second, our focus on uncertainty probably undermined support for the view of scientists as a reliable source of information.

12 None of the panelists used these terms of course. People did not speak of their faith in the scientific method. Rather we drew this inference from among many comments panel members made such as: "Let's take steps now to reduce greenhouse gases, and then let's see where we are (i.e., how much scientists have learned and now know about the issue through the accumulation of data) in five or ten years."

13 See *Science and the Public: Volume III: Global Warming Caused by the Greenhouse Effect.*

14 For a detailed discussion of how the panel's views about nuclear power compared to the views of the scientists, see *Science and the Public: Volume III: Global Warming Caused by the Greenhouse Effect.*

15 See *Science and the Public: Volume II: The Disposal of Solid Waste* and *Volume III: Global Warming Caused by the Greenhouse Effect.*

16 The factors below should not be construed as a comprehensive list but rather as a starting point.

17 And as noted in *Science and the Public: Volume III: Global Warming Caused by the Greenhouse Effect* the public's forecast was nearly identical to the views of the 418 leading scientists.

18 For further information see *Science and the Public: Volume II: The Disposal of Solid Waste.*

19 In an investigation of public opinion about the federal deficit, we found that people thought the budget could be balanced painlessly through the elimination of "waste, fraud and abuse." While it is indisputable that the government wastes a lot of money, it is also certain that 200 billion dollars of "waste" can never be recovered. The authors are not experts in the field of solar energy, air pollution or gasoline, and we are hesitant about characterizing these views as "wishful thinking." However, a review of the 100 expert interviews conducted for the project leads us to conclude that the panel's views are almost certainly overestimates.

20 The scientists were asked a slightly more specific question: "Because of toxic ash and the possibility of emitting dioxin, burning solid waste in even the most modern solid waste-to-energy incinerators is a serious threat to public health."

21 Complete question wording is as follows: "Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"

22 About 5 to 9 percent of the nation's trash is currently incinerated. Estimates include 5 percent from the National Solid Wastes Management Association and 9 percent from the Environmental Protection Agency in "The Solid Waste Dilemma: An Agenda for Action," 1989.

23 For a complete listing of states in each region, please see the map on page 69.

TABLE 1
Proposals Illustrating Support for Recycling (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

Proposal	Scientists	Posttest
	%	%
Recycle into three containers	92	90
Place a five cent deposit on bottles and cans	88	84
Require people to take hazardous waste to a centrally located drop-off center	85	84
Place a fee on all nonrecyclable packaging	82	69
Give tax incentives to businesses using recycled paper	78	66
Require publishing companies to use recycled paper	75	85
Require companies to recycle	74	74
Recycle into five containers	56	64

TABLE 2
Proposals Illustrating Support for Source Reduction (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

Proposal	Scientists	Posttest
	%	%
Require manufacturers to reduce packaging	51	72

"Indicate whether we should ban or tax the following disposable products to discourage people from buying them:"

Tax or Ban	Scientists	Posttest
	%	%
Styrofoam cups, containers, etc.	75	66
Disposable diapers	63	53
Plastic bags	63	53
Disposable plastic products (pens, razors, etc.)	59	55
Paper products, napkins and cups	30	37

TABLE 3
Proposals Illustrating Support for Incineration (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:
a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

Proposal	Posttest
	%
Build more incinerators, concern about safety	70
Build more incinerators near residential areas	56

"When it comes to the safety of each of the following, would you say there is:
– Almost no risk or danger;
– Some risk or danger, but an acceptable level;
– A great deal of risk or danger at an unacceptable level?"

"Emissions from solid waste incinerators"	Posttest	Almost no risk/ An acceptable level
	%	%
Almost no risk	11	58
Acceptable level	47	
Unacceptable level of risk	22	
Not sure	20	

"Indicate whether you agree or disagree with the statements below:"

"Burning solid waste in even the most modern waste-to-energy incinerators is a serious threat to public health"[20]

Burning waste in incinerators is a public health threat:	Scientists	Posttest
	%	%
Agree	12	28
Disagree	51	49
Not sure	37	23

TABLE 3
(Continued)

"EPA Director William Reilly recently said Americans are 'too concerned' about some threats to the environment and public health, and 'not concerned enough' about others. For each threat below, indicate whether you think the level of public concern is too high, too low, or about right:"

"The safety of solid waste-to-energy incinerators"

The level of public concern about incinerators is:	Scientists
	%
Too high	33
About right	32
Too low	10
Not sure	26

Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000.[21]

"Incineration"[22]

Percent of Solid Waste to be Disposed of Using Incineration in the year 2000	Scientists	Twenty Percent or More
	%	%
Less than ten percent	11	
Ten to nineteen	32	
Twenty to twenty-nine	29	47
Thirty to thirty-nine	9	
Forty to forty-nine	5	
Fifty percent or more	5	
Not sure/No answer	10	

Mean = 20 percent.
Median = 20 percent.

TABLE 4
Proposals That Were Accepted by the Scientists and the Panel
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/ Phase it in"	
Proposal	Scientists	Posttest
	%	%
40 mpg standard for new cars by 2000	79	75
More spending on mass transit	77	59
Tax breaks to builders for passive solar	71	56
Have the U.S. take the lead in international efforts	70	70
Require businesses to improve fuel efficiency	69	70
Tax breaks to industry for insulation	69	58
Tax breaks to homeowners for insulation	68	65
Require utilities to burn less coal	68	63
Require communities to plant more trees	61	68
More government funding for solar research	59	67
Reduce the number of trees cut in the U.S.	57	69

TABLE 5

Proposals That Were Rejected by the Scientists and the Panel

(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/ Phase it in"	
Proposal	Scientists	Posttest
	%	%
Drill for natural gas offshore	44	43
10 cents a gallon gas tax over each of the next ten years	38	11
Ban cars that get low gas mileage	37	25
Require people to keep thermostat at 65	29	30
Tax homeowners' use of heating oil	29	17
Drill for natural gas in national parks	26	32
Tax two-car families	16	11
Ration gasoline (alternate day buying)	6	7

TABLE 6

Proposals That Were Accepted By One Group and Not the Other

(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/ Phase it in"	
Proposal	Scientists	Posttest
	%	%
Impose a tax on "gas guzzlers," cars that get poor gas mileage	75	37
Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect)	68	45
Give more aid to Brazil if they stop destroying the rain forests	50	38
Raise the gasoline tax to 25 cents a gallon	50	11
Increase the miles-per-gallon standard to 50 by the year 2000	43	59
Reimpose and strictly enforce a 55 miles-per-hour speed limit	43	52

TABLE 7

Perceived Causes of the Greenhouse Effect (Comparison of Pretest and Posttest)

"Indicate whether you think each of the following is a major cause of the greenhouse effect, a minor cause, or not a cause at all:"

	Pretest	Posttest	Change
	%	%	
Pollution/emissions from business and industry			
Major cause	77	84	+7
Minor cause	10	9	-1
Not a cause	1	3	+2
People driving their cars			
Major cause	52	80	+28
Minor cause	32	16	-16
Not a cause	3	2	-1
The destruction of tropical forests in Brazil and other countries			
Major cause	52	78	+26
Minor cause	12	14	+2
Not a cause	6	2	-4
The use of pesticides*			
Major cause	39	22	-17
Minor cause	27	29	+2
Not a cause	15	35	+20
Pollution\emissions from nuclear power plants*			
Major cause	37	17	-20
Minor cause	19	19	nc
Not a cause	19	57	+38
The use of coal by utilities or electric companies			
Major cause	32	71	+39
Minor cause	28	20	-8
Not a cause	7	2	-5
People heating and cooling their homes			
Major cause	10	39	+29
Minor cause	40	50	+10
Not a cause	25	7	-18
Solar energy*			
Major cause	3	2	-1
Minor cause	6	6	nc
Not a cause	68	83	+15

* Incorrect Answer

TABLE 8

Proposals Involving Solid Waste Where Understanding Increased

(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

	Pretest	Posttest	Change
	%	%	
Build more incinerators, concern about safety			
Do now/phase in	36	70	
Don't do	33	19	
Not sure	31	11	-20
Require manufacturers to reduce packaging			
Do now/phase in	43	72	
Don't do	29	20	
Not sure	28	8	-20
Build more landfills			
Do now/phase in	38	51	
Don't do	39	37	
Not sure	23	13	-10
Place a fee on all nonrecyclable packaging			
Do now/phase in	65	69	
Don't do	17	22	
Not sure	17	9	-8
Build more incinerators near residential areas			
Do now/phase in	30	56	
Don't do	50	32	
Not sure	20	12	-8
Require companies to recycle			
Do now/phase in	74	74	
Don't do	27	15	
Not sure	18	11	-7

TABLE 9
Understanding of Solid Waste Disposal and the Greenhouse Effect
(Posttest)

"As a result of this evening's session, would you say your understanding of the issues related to the disposal of solid waste:"

Understanding of the disposal of solid waste	Posttest
	%
Increased a lot	54
Increased somewhat	32
Increased a little	9
Did not increase at all	2
Not sure	3

"And what about your understanding of the greenhouse effect? As a result of this evening's session, would you say that it:"

Understanding of the greenhouse effect	Posttest
	%
Increased a lot	54
Increased somewhat	27
Increased a little	10
Did not increase at all	7
Not sure	3

TABLE 10

Views About the Public and Zero Risk (Scientists)

"Some scientists and other experts complain that the public has unrealistic expectations about risk, that people want a risk-free or 'zero risk' environment when there is no such thing. Are the public's expectations unrealistic when it comes to:"

	Scientists
	%
Nuclear power plants	
Yes, unrealistic	62
No, not unrealistic	29
Not sure	9
The use of pesticides in agriculture	
Yes, unrealistic	51
No, not unrealistic	34
Not sure	16
How clean we should make hazardous waste sites when we clean them up	
Yes, unrealistic	50
No, not unrealistic	35
Not sure	15
Emissions from solid waste incinerators	
Yes, unrealistic	43
No, not unrealistic	29
Not sure	28
The safety of birth control pills	
Yes, unrealistic	38
No, not unrealistic	35
Not sure	27
The purity of ordinary drinking water	
Yes, unrealistic	34
No, not unrealistic	57
Not sure	10
Vaccines for diseases like whooping cough	
Yes, unrealistic	32
No, not unrealistic	45
Not sure	24
The safety of the blood supply	
Yes, unrealistic	22
Not, not unrealistic	57
Not sure	21

TABLE 11
Views About Incineration
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build more incinerators that turn solid waste into electricity even if some scientists say they pose a danger to the public"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	14	36	31	70	+34
Phase in	22		39		
Don't do	33		19		
Not sure	31		11		

"Build more incinerators that turn solid waste into electricity even if that means locating them near residential neighborhoods"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	7	30	18	56	+26
Phase in	23		38		
Don't do	50		32		
Not sure	20		12		

TABLE 12
Views About Scientists
(Comparison of Pretest and Posttest)

"Which statement comes closer to your own view?

In general, when talking about environmental issues, would you say:
A. Scientists are reliable and a trustworthy source of information
OR
B. Scientists often exaggerate the problems and dangers we face"

Statement	Pretest	Posttest
	%	%
Scientists are a reliable source of information	58	50
Scientists often exaggerate the dangers we face	28	37
Not sure	15	13

TABLE 13
Views About Scientists
(Posttest)

"Indicate whether you agree or disagree with the statements below:"

"Scientists are very open-minded and willing to consider any new idea, no matter how far-fetched it may seem, as long as it can be tested using the scientific method."

Scientists are very open-minded	Posttest
	%
Agree	52
Disagree	23
Not sure	26

TABLE 14
Views About Various Beliefs
(Posttest)

"For each of the following, please indicate whether you:
- a. Are convinced it is true
- b. Tend to believe it's true though you're not absolutely convinced
- c. Tend to believe it's false though you're not absolutely convinced
- d. Are convinced it is false"

	Posttest
	%
The existence of God	
Convinced it's true/Tend to believe it's true	91
Convinced it's false/Tend to believe it's false	4
Not sure	5
The theory of relativity	
Convinced it's true/Tend to believe it's true	73
Convinced it's false/Tend to believe it's false	3
Not sure	24
The theory of evolution	
Convinced it's true/Tend to believe it's true	55
Convinced it's false/Tend to believe it's false	33
Not sure	13
Astrology	
Convinced it's true/Tend to believe it's true	36
Convinced it's false/Tend to believe it's false	51
Not sure	13
The healing power of rock crystals	
Convinced it's true/Tend to believe it's true	5
Convinced it's false/Tend to believe it's false	69
Not sure	26

TABLE 15
Has Global Warming Already Started?
(Comparison of Scientists and Posttest)

"Indicate whether you agree or disagree with the statements below:"

"Global warming caused by the greenhouse effect has already started."

Global warming has started:	Scientists	Posttest
	%	%
Agree	40	73
Disagree	13	6
Not sure	47	21

TABLE 16

Views About Proposals to Address the Greenhouse Effect (Comparison of Pretest, Posttest and the Scientists)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Impose a tax on 'gas guzzlers,' cars that get poor gas mileage even if that would sharply increase the cost of full-size cars and station wagons"

	Pretest	Posttest	Scientists
	%	%	%
Do immediately/Phase in	42	37	75
Only if serious/Don't do	50	60	22
Not sure	8	4	2

"Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect) even if that means living with the risks posed by that technology"

	Pretest	Posttest	Scientists
	%	%	%
Do immediately/Phase in	36	45	68
Only if serious/Don't do	45	46	27
Not sure	19	10	5

"Raise the gasoline tax by 25 cents a gallon even if that would burden truckers and others who need their cars for work"

	Pretest	Posttest	Scientists
	%	%	%
Do immediately/Phase in	7	11	50
Only if serious/Don't do	8	87	44
Not sure	8	3	6

TABLE 17
Views About Nuclear Power
(Comparison of Education Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect) even if that means living with the risks posed by that technology"

	High School or Less	College Degree or More	Difference
	%	%	
Do immediately/Phase in	46	50	+4
Only if serious/Don't do	41	42	+1
Not sure	12	8	

TABLE 18
Views About a Gas Guzzler Tax
(Comparison of Education Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Impose a tax on 'gas guzzlers,' cars that get poor gas mileage even if that would sharply increase the cost of full-size cars and station wagons"

	High School or Less	College Degree or More	Difference
	%	%	
Do immediately/Phase in	27	46	+19
Only if serious/Don't do	67	51	-16
Not sure	6	3	

TABLE 19
Views About Business and Industry
(Comparison of Pretest and Posttest)

"Do you agree or disagree with these statements?"

"If most businesses and industries were willing to take a small cut in profits, they could easily eliminate most pollution and other emissions contributing to the greenhouse effect"

Statement	Pretest	Posttest
	%	%
Agree	54	64
Disagree	15	22
Not sure	31	15

TABLE 20
Views About Solar Energy
(Comparison of Pretest and Posttest)

"Which statement comes closer to your own view?

The main reason why we don't use more solar energy today is because:

A. The big oil companies are trying to block the development of solar energy in order to protect their profits
OR
B. Solar energy is simply too expensive, given our present technology"

Statement	Pretest	Posttest	Change
	%	%	
Oil companies are blocking the profits	37	41	+4
Solar energy is too expensive	35	49	+14
Not sure	28	10	

TABLE 21
How Much Energy Could Be Provided By Solar Power (Posttest)

"How much of this country's energy could realistically be provided by solar energy by the year 2025?"

How much could be provided by solar energy	Posttest	Twenty percent or more
	%	%
Very little (less than 10%)	16	
Some but not a tremendous amount (10 to 20%)	33	
A considerable amount (20 to 50%)	26	37
More than half of our electricity	11	
Not sure	14	

Appendix A:

History of the Project

In undertaking this work, Public Agenda's first step was to define and narrow the scope of the research. To this end we asked former Public Agenda Issues Director, Richard Harwood of the Harwood Group, a nonpartisan research organization based in Washington D.C., to conduct a series of in-depth interviews with some of the country's most prominent scientists, science leaders and policy makers, including Erich Bloch, Director of the National Science Foundation, and Lee Thomas, former Administrator of the U.S. Environmental Protection Agency. Harwood's interviews covered a wide range of questions about science and the public, and his report, *The Public's Role in Science Issues*, was published by the Kettering Foundation in 1989.

Working with Harwood and using his work along with an analysis of existing survey data from the Roper Data Center at the University of Connecticut, Public Agenda's Director of Programs, Jean Johnson, identified a variety of issues to be the focus of the next stage of investigation. The issues were to serve as proxies for larger concerns. Three criteria were used to select the proxy issues: 1) leading science and technology experts expressed concern about the public's ability to participate in debate on the issue (in the interviews conducted by Harwood); 2) existing public opinion data suggested widespread public misunderstanding of the issue; and 3) recent experience suggested that policy debate on the issue was, or might be, blocked due to conflicting scientific or technological claims.

Using these criteria, five issues were selected for further investigation. They were:

1. The disposal of solid waste;
2. The threat of global warming caused by the greenhouse effect;
3. A permanent, manned space station;
4. Artificial life maintenance, when to use artificial means (including respirators, intravenous feeding, etc.); and
5. Finding a cure for AIDS.

Realizing that we could not thoroughly investigate the public's thinking about five issues simultaneously, we worked to again narrow our focus. From October to December, 1988, Public Agenda conducted a series of eight focus groups, in Birmingham, Boston, Chicago, Houston, Nashville, New York, Omaha, and San Francisco. Each group included roughly a dozen respondents representing a cross section of the community according to age, sex, race and education. Analysis of those discussions enabled us to begin to understand what most Americans thought about each proxy issue, along with the more general question about how people approach the category of issues that are scientifically or technologically complex.

An analysis of the preliminary research was presented to the Kettering Foundation in a January, 1989 report written by Jean Johnson. That report suggested a focus for further investigation.

1. Determine whether the public can understand issues that are scientifically or technologically complex.
2. Determine what it mean for citizens to be "well informed" about such issues and whether they need to understand an issue in all its technical complexity in order to reach a reasonable judgment about it.
3. Determine how people's thinking about such issues change as they have the time and opportunity to consider them thoughtfully.
4. Determine whether citizens reach an impasse or deadlock when relying on experts who do not agree about a problem's urgency, causes, or solutions.
5. Determine whether or the extent to which there is a gap between the thinking of the public and experts such as a group of leading American scientists.

In conjunction with Kettering, we agreed to further narrow our list of candidate issues, selecting two to serve as proxies for a wide range of issues: the disposal of solid waste and the threat of global warming caused by the greenhouse effect. Preliminary work suggested that these were particularly good candidates for a comparative analysis since both:

- Are a source of controversy and political deadlock;
- Are scientifically and technically complex and thus difficult for typical citizens to understand easily;
- Involve broad areas of scientific uncertainty, issues about which experts disagree;
- Involve a certain degree of risk, as well as difficult and controversial trade-offs; and

- Are issues about which political leaders and policy makers have found it difficult to communicate with the citizenry about, both nationally and in various communities.

The two issues also present interesting areas of contrast because, while they both involve the environmental matters:

- One is essentially a local issue while the other is national/international in scope;
- One is an immediate problem while the other involves the long term;
- One poses serious but essentially moderate risks while the other has the potential to be catastrophic;
- One involves areas in which scientific uncertainty is rather narrow and clear-cut (focusing as it does on incinerator safety) while the greenhouse effect is a subject of tremendous uncertainty and disagreement about the diagnosis of the problem, its potential effects, when those effects will be felt, etc.; and
- The resolution of the two issues may involve proposals or solutions at diametrically opposed levels of difficulty, expense and sacrifice.

The Research Method:
At the conclusion of the first phase of our research, the Kettering Foundation asked Public Agenda to employ Citizen Review Panels, a methodology that combines the strengths of focus groups and traditional survey research developed to investigate public opinion about issues where people's thinking is inconsistent, contradictory and largely uninformed. (The method has been used in three earlier studies: an analysis of public opinion about social welfare policy, conducted for the Ford Foundation; a study of public opinion about the state of US-Soviet relations in the year 2010, a multi-year project conducted in conjunction with the Center for Foreign Policy Development at Brown University; and a study of public opinion in Alabama about prison overcrowding and the use of alternative sentences, conducted for the Edna McConnell Clark Foundation).

The Citizen Review Panel enables us to explore people's thinking at greater depth, thereby generating results that cannot be gleaned using ordinary polling. The Panel has a particular advantage over even the most sophisticated polling methods in that it enables us to gauge people's thinking at two points in time: 1) in the present, given their current level of understanding; and 2) after they have had a chance to understand the issue and its causes, learn about various proposed solutions along with the costs, risks, and trade-offs involved with each, and hear about the precise areas of scientific/expert uncertainty or disagreement. The method was designed to explore what we call "public judgment," that is, public opinion after people have had time to learn about an issue, confront inconsistencies in their own thinking, understand what dealing with the problem would involve, and consider the pro and con arguments of various proposals.

Respondents learned about the issues in two ways: by watching videos produced by Public Agenda about the two issues, and by breaking up into groups of about twelve to discuss each issue at some length. The panel was selected using a quota sample, not a probability sample, and therefore sampling error cannot be calculated with the same degree of statistical precision as with a national probability sample. However, the group of 402 respondents was drawn to reflect a cross section of the noninstitutionalized, voting age population of the United States using a variety of criteria including geography, age, sex, race and education. Finally, the use of questionnaires and open-ended discussions enable us to present both quantitative findings and qualitative interpretation.

The ability to present the issues clearly to a group of typical citizens required that we gain a thorough understanding of the issues first. Therefore, Public Agenda staff conducted more than 100 telephone interviews with political leaders, scientists, journalists, and others who are experts on solid waste disposal or the threat of global warming. (A complete listing of the experts interviewed can be found in Appendix D.) Staff also visited a recycling plant in Sommerset County, New Jersey and an incinerator (or resource-recovery facility) in Warren County, New Jersey in order to gain a deeper, first-hand understanding of each.

The panels were held in four sites, Chicago, Hartford, Los Angeles and Nashville, over a three week period from September 25 to October 13, 1989, at which a cross section of 402 people came together for three-hour sessions in which they were asked to:

1. Fill out a pretest questionnaire that asked them to rate the priority of various national problems including solid waste disposal and the threat of global warming from the greenhouse effect and asked them to evaluate a wide variety of steps the country might take to address the problems of solid waste disposal and the threat of global warming;

2. Watch a fifteen-minute video describing the issue of solid waste disposal in a balanced way and presenting the four principal solutions (source reduction, recycling, incineration, and landfill), along with pro and con arguments for each solution;
3. Break up into groups of about twelve people each where, under the direction of a moderator from Public Agenda, they discussed the issue of solid waste disposal for about thirty minutes;
4. Reconvene to watch a second video about the threat of global warming which also presented the issue in a balanced way, discussed what experts do and do not agree on, and described an assortment of proposals to reduce the buildup of greenhouse emissions along with the pros and cons of each;
5. Break up again into groups of about twelve to discuss the greenhouse effect for about forty-five minutes;
6. Fill out a posttest questionnaire in which they were asked the same questions as in the pretest to gauge how they felt about these two issues after they had a chance to learn more about them including their cause, their possible effects, and the costs, trade-offs, and sacrifices that addressing each one would involve.

The Views of the Nation's Leading Scientists:
In addition to public opinion, Kettering asked Public Agenda to explore expert and leadership opinion, including whether and how it differed from public opinion -- again, with the ultimate aim of understanding how the public might constructively participate in policy discussions about troublesome national issues. To do so, we surveyed 418 of the nation's leading scientists to find out how they felt about the two issues, and how they felt about the public's role in formulating policy about issues that are scientifically or technologically complex.

We prepared a lengthy questionnaire that included a large number of identical items used in the Panel. Then, working with a list of leading scientists randomly selected by Research Projects Corporation of Woodbury, Connecticut (using W.W. Bowker's *Men and Women in Science*, the 1989 edition, *Who's Who in America*, among other reference volumes), we sent a cover letter and questionnaire to 1,620 of the country's leading scientists. Questionnaires were sent out beginning June 24, 1989, and returns were accepted until August 10. We received a total of 418 responses, a return rate of just under 26 percent. In each of the three volumes, we discuss the views of the leading scientists, and compare and contrast their thinking to the public's as expressed by the panel.

Appendix B:
Methodology

The National Panel: To interview a representative cross section of the noninstitutionalized, voting age population of the United States, we drew a sample using quotas reflecting both regional and, when aggregated, the national population. The sample was designed using data in the *1986 State and Metropolitan Area Data Book* and the *1987 Statistical Abstract of the United States*, published by the U.S. Bureau of Census, and from three national surveys of over 1,000 people conducted by *Americans Talk Security*, a series of national, public opinion telephone surveys conducted by three prominent public opinion firms -- DYG Inc., Market Opinion Research, and Marttila and Kiley - in association with the Public Agenda Foundation. The methodology involved bringing together groups of about fifty people per night for sessions lasting just over three hours. A number of steps, detailed below, were involved in designing the panel.

First, our base for the national panel was designed to be 400 respondents, a large enough sample to provide statistical stability, and to permit regional and subgroup analysis.

Second, for administrative reasons, we conducted the panels in a total of four sites. Using standard Census Bureau divisions, we divided the United States into four principal regions: the Northeast, Midwest, South, and West[23], and drew a sample proportionate to each region's share of the national population. That is, since 22 percent of the nation's population lives in the Northeast, the sample was designed so that about 22 percent of our sample would come from the site chosen to represent that region. (See Table 22.)

Third, since there was no significant regional variation on the basis of sex, our sample quota was 50 percent male and 50 percent female.

Fourth, since there was also no significant regional variation in terms of the average (or mean) age of the population, we collected data about this variable using three national surveys and compiled a three-survey average. This average then became part of the recruiting specifications for each site. That is, in the U.S. as a whole, 23 percent of the noninstitutionalized voting age population is between the ages

of 18 and 29. Therefore, in each of our four sites, 23 percent of the respondents were to be between 18 and 29 years of age. (See Table 23.)

Fifth, we identified three key demographic indicators for which there was significant regional variation and which could also be used as recruiting specifications: race, education and median family income. We then compiled data about each region's demography in terms of those variables.

Sixth, we identified a particular site to represent each of the four regions. Since each site was, in effect, a proxy for the region as a whole, it had to meet a variety of criteria:

a) Each site had to reflect the region's demographic makeup using three key indicators: race, education and median family income. After compiling the regional data, we compared it to the demography of a list of candidate sites within each region and looked for the best match. The demography of the adult population in each site's metropolitan statistical area (MSA) had to approximately reflect the region as a whole. For example, Hartford was the site chosen to represent the Northeast. In the Northeast region of the U.S., 10 percent of the population is black/African-American compared to 7 percent in the Hartford MSA. In terms of education, 33 percent of the people in the Northeast population have less than 12 years of school compared to 30 percent of the people in greater Hartford. According to the Census Bureau, the 1985 median family income for the Northeast was $20,651 in 1986 and $23,372 for Hartford. (See Table 24.)

b) Each site had to represent the region's central social, demographic, cultural and historical character. In each case, we wanted a site that did not have either a unique ethnic mix or history, or an atypical industrial base compared to the region as a whole. Thus, for example, Providence was rejected because it has a large Portuguese population. New Haven was rejected because it is so influenced by the presence of Yale University. New Orleans was rejected because of its history, atypical ethnic makeup and dependence on tourism.

c) Each topic was taken into consideration. Since solid waste is a local problem, we wanted sites that had at least some controversy with this issue; otherwise, respondents might have found questions about the issue meaningless. A large number of southern cities that otherwise might have been a good match for the region as a whole (such as Birmingham, for example) did not have much of a solid waste problem. Landfill costs are low and space for new landfills is comparatively abundant in many parts of the south. However, in Nashville solid waste disposal has been a major issue.

d) Our other topic, the greenhouse effect, is a national/global issue, not a local one. However, since so many of the proposals to reduce emissions contributing to the buildup of greenhouse gases involve the automobile, we rejected certain sites such as Detroit that are economically dependent on the automobile industry.

e) Finally, each site had to be large enough to have a recruiting agency that could bring together enough people to meet our quotas. After establishing quotas based on sex, race and education for each site, we used them as recruiting specifications for the organizations working with us to recruit respondents.

After taking all this into consideration, we chose the following sites:
Nashville, TN to represent the South;
Chicago, IL to represent the Midwest;
Los Angeles, CA to represent the West; and
Hartford, CT to represent the Northeast.

When the research was completed and the sample was aggregated, we compared it to national totals certain variables, including some, such as political party, that were not part of the recruiting specifications but which, in a well drawn sample, should match the national totals within a few percentage points. All discrepancies between the mean score for any site and region resemble normal sample variations using a national probability sample of 402 respondents. As is standard procedure using even national probability samples drawn using both listed and unlisted telephone numbers, we then weighted the data to bring the demographics more into line with the national totals. The only variables where the number of respondents differed significantly from the recruiting specifications were education (in that the panel included more respondents with "some college" and fewer with a "high school education or less" than the quotas called for) and the income (in that panel included fewer respondents with an annual family income of $30,000 or less and more with an income of $30,000 to $50,000). In Table 25, we show the weighted sample compared to the quota used to recruit respondents. In Tables 26 and 27, we present the weighted and unweighted data compared to national totals determined by U.S. Census data and the three ATS surveys. (See Tables 25 to 27.)

TABLE 22
Targeted Panel Composition by Region

Area	Population	U.S. Pop.	Quota	Actual Sample	Sample Size
	(in millions)	%	%	%	(respondents)
National Total	239	100	100	100	402
Northeast	50	22	22	21	84
Midwest	59	25	25	24	97
South/West Central	82	34	34	33	133
West	48	20	20	22	87

TABLE 23
National Distribution By Age Group

Age	ATS #1	ATS #6	ATS #12	3 Survey Average
	%	%	%	%
18 to 29	26	22	22	23
30 to 39	21	24	22	22
40 to 49	19	17	19	18
50 to 64	19	19	19	19
65 and over	15	17	18	17

* Due to rounding, percentages may not always add to 100%.

TABLE 24
Targeted Panel Demographics By Region and Site

Region/Site	Race			Education			Income
	Black/ Afr-Amer	White	Hispanic	12 yrs or less	12-16 years	16+ years	Median Family
	%	%	%	%	%	%	(1985)
National Total	12	83	6	34	50	16	$19,917
Northeast	10	86	5	33	50	17	$20,651
Hartford, CT.	7	90	4	30	50	20	$23,372
Midwest	9	89	2	32	53	15	$20,988
Chicago, IL.	20	74	8	33	49	18	$24,514
South	19	78	6	40	45	15	$17,857
Nashville, TN.	16	83	1	36	47	17	$19,654
West	5	81	15	26	55	19	$20,974
Los Angeles, CA.	9	74	24	28	54	18	$21,744

* Due to rounding, percentages may not always add to 100%.

TABLE 25
Comparison of Quotas to the Weighted Panel Sample

		Sample Quotas	Weighted Sample
		%	%
Region	Northeast	22	21
	Midwest	25	24
	South	34	33
	West	20	22
Sex	Male	50	50
	Female	50	50
Age	18-29	23	22
	30-39	24	24
	40-49	19	18
	50-64	19	19
	65/over	15	17
Education	12 yr. or less	34	37
	12-16 yr.	50	37
	16 yr./more	16	25
Race	Black/ African-American	12	7
	Hispanic	6	6
	White	83	84
	Asian	NA	2
Income	Less than $30,000	56	39
	$30,000-$50,000	27	39
	Over $50,000	17	21
Party	Republican	41	39
	Democrat	44	46
	Independent or other	15	15

* Due to rounding, numbers may not always add to 100%

TABLE 26
Comparison of U.S. Census Data to Unweighted and Weighted Sample
(U.S. Census and Panel)

		Unweighted U.S. Census	Weighted Sample	Sample
		%	%	%
Region	Northeast	22	20	21
	Midwest	25	25	24
	South	34	36	33
	West	20	21	22
Sex	Male	49	45	50
	Female	51	54	50

* Due to rounding, percentages may not always add to 100%

TABLE 27
Comparison of ATS Sample to Unweighted and Weighted Sample
(ATS and Panel)

		3 Survey Average	Sample Unweighted Results	Sample Weighted Results
		%	%	%
Age	18-29	23	23	22
	30-39	22	24	24
	40-49	18	18	18
	50-64	19	19	19
	65/over	17	15	17
Education	12 yr. or less	46	25	37
	12-16 yr.	26	47	37
	16 yr./more	27	24	25
Race	Black/Afr-Amer	10	11	7
	Hispanic	3	8	6
	White	84	80	84
	Asian	1	2	2

* Due to rounding, numbers may not always add to 100%

Demographic Sources:

Americans Talk Security #1, Marttila & Kiley, October, 1987.

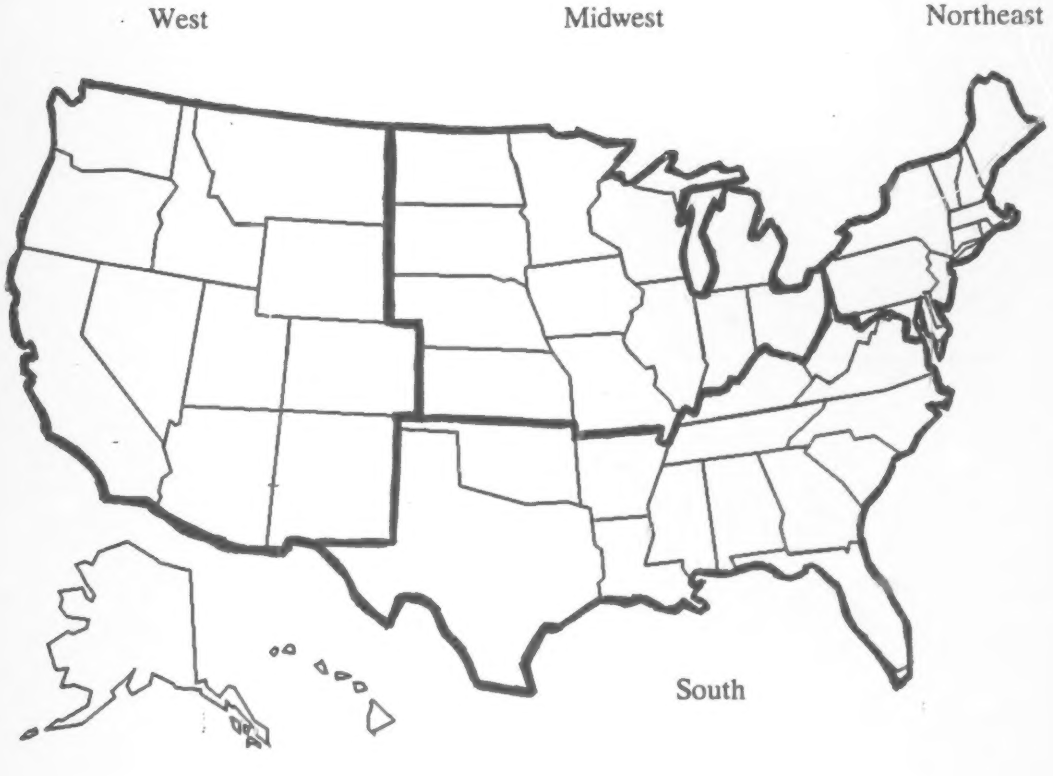
Americans Talk Security #6, Marttila & Kiley, May, 1988.

Americans Talk Security #12, Market Opinion Research, January, 1989.

1986 State and Metropolitan Area Data Book, U.S. Bureau of Census, 1986.

1987 Statistical Abstract of the United States, U.S. Bureau of Census, 1987.

Diagram 1
Map of Regions


West
Midwest
Northeast
South

Appendix C:

The Leading Scientists

The Public Agenda Foundation interviewed a total of 418 of this country's leading scientists and other prominent members of the scientific community by mail between June 19, 1989 and September 11, 1989. Questionnaires with a cover letter and a self-addressed return envelope were sent out to 1500 leading scientists chosen at random by Research Projects Corporation of Woodbury, CT using *American Men And Women in Science, The 17th Edition*, by R.R. Bowker, *Who's Who in America* among other reference volumes. The rate of completed interviews returned from those originally sent out was 28 percent.

Scientist Demographics

	Percent of Sample %
Field of Science	
Chemistry	24
Biology/Health Sciences	21
Earth sciences (including geophysics)	19
Physics	19
Social Sciences	6
Engineering	4
Computer Sciences	3
All Other	5
Education Level	
College graduate or less	4
Some graduate school	14
Ph.D. or post-doctoral work	82
Gender	
Male	89
Female	10
Prefer not to answer	1
Political Party	
Republican	26
Democrat	37
Independent	34
Not sure	1
Prefer not to answer	2

Appendix D:
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Science and the Public: A Report in Three Volumes

Volume II:

The Disposal of Solid Waste

SCIENCE AND THE PUBLIC: A REPORT IN THREE VOLUMES

Volume II: The Disposal of Solid Waste

A Study for the Charles F. Kettering Foundation
Comparing the Perspectives of Citizens and Scientists

by

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Introduction

Science and the Public: Issues and Methods

In 1988, the Public Agenda Foundation, which is dedicated to enhancing the public's ability to resolve complex political and social issues, was asked by the Kettering Foundation, its collaborator and partner on numerous projects of common interest, to explore the public's capacity to think through policy issues that concern matters of scientific or technological complexity.

Ongoing work by Public Agenda and Kettering has shown that exposure to brief, highly-focused, well-researched, educational interventions on contentious social or political problems can help the general public develop understandings and assessments that are often more realistic and consistent than earlier views. In the language of Public Agenda, the public can move from mass opinion -- top-of-the-head views -- to judgment, a more measured and thoughtful analysis.

The questions were: Could the same process hold for scientific issues that were threaded with uncertainty? Or were such technical issues intrinsically different from social or political problems, however contentious? Did issues of scientific complexity raise considerations that, in essence, were beyond the public's understanding?

As our first step, we carefully defined the kind of issues that would best illuminate the public's response to matters of scientific or technological complexity. With the aid of the Harwood Group, a research organization in Washington, D.C., which conducted a series of interviews with leading scientists, and decision makers (including former EPA Administrator Lee Thomas, former White House Science Advisor George Keyworth and National Science Foundation Director Erich Bloch), we determined that the issue should have three characteristics:

1. Leading science and technology experts should be concerned about the ability of the public to grasp the issue.
2. Existing public opinion data should suggest that the public displays widespread misunderstanding of the issue.

3. Recent experience should suggest that policy debate on the issue has been marked by conflicting scientific or technological claims about the seriousness of the issue or the usefulness and/or safety of proposed solutions.

After further preliminary study, including eight focus groups with the general public (in Birmingham, Boston, Chicago, Houston, Nashville, New York, Omaha, and San Francisco), we chose to explore the public's thinking on two exemplary environmental issues: the disposal of solid waste and the threat of global warming caused by the greenhouse effect.

These issues form a good basis for analysis because they simultaneously have important similarities and important differences.

In terms of their similarities, both issues:

1. Are a source of sharp political controversy;
2. Are scientifically complex and packed with technical information;
3. Involve broad areas of scientific uncertainty or questions about which experts disagree;
4. Involve a certain degree of risk as well as difficult and controversial trade-offs; and
5. Are subjects that leadership has found it difficult to communicate about with the public, both nationally and in various communities.

In terms of their differences, the two issues present clear contrasts:

1. Solid waste disposal is essentially a local issue while the threat of global warming caused by the greenhouse effect is national/international in scope.
2. Solid waste disposal is an immediate problem while the greenhouse effect is a long-term problem.
3. Solid waste disposal poses serious but essentially moderate risks while the greenhouse effect has the potential to be catastrophic.

4. Solid waste disposal involves areas in which scientific uncertainty is rather narrow and clear-cut (focusing mainly on incinerator safety) while the greenhouse effect is a subject in which high uncertainty and disagreement surrounds many elements, including the diagnosis of the problem, its potential effects, and when the effects may be felt.
5. The resolution of waste disposal and the greenhouse effect is likely to involve proposals or solutions that place different types of burdens on the general public (e.g. the public may regard a gasoline tax as far more burdensome than recycling).

To investigate the public's opinions about the issues and its ability to think about them, we used a research method called a Citizen Review Panel in which we examine people's views at two points in time: first, in the present, at their current, unenhanced level of understanding -- that is, their top-of-the-head opinions; and second, after they have had a chance to learn about the issue, its causes, various possible solutions, the costs, risks, and trade-offs associated with it, and about the specific areas that are marked by scientific/expert uncertainty or disagreement. The second set of views represent, in other words, the public's more considered judgment. In general, a comparison between the first and second views may indicate whether the public is handling an issue with increased thoughtfulness and sophistication, and suggest the direction in which the public will move when given a more thorough discussion of the issues.

Four hundred and two respondents from four cities -- Chicago, Hartford, Los Angeles, and Nashville -- were chosen to reflect a cross section of the noninstitutionalized, voting age population of the United States. During the period from September 25 to October 13, 1989, a group of respondents met in each city for a three-hour session.

Each session consisted of the following segments:

1. Panel members filled out a "pretest" questionnaire that asked them to rate the urgency of the two environmental issues among a list of national problems and to evaluate a wide variety of possible actions to deal with the issues.

2. Panel members next watched a fifteen minute video describing in a balanced way the issue of solid waste disposal and the four principal solutions to the problem (source reduction, recycling, incineration, and landfill), with pro and con arguments for each solution.
3. Panel members broke up into groups of about twelve to discuss the issue.
4. After a short break, panel members reconvened to watch a second video that presented the threat of global warming in a balanced way, went on to discuss what experts do and do not agree on, and described an assortment of proposals to reduce the buildup of greenhouse emissions, with the pros and cons of each proposal.
5. The panel broke up again into groups of about twelve people each to discuss the greenhouse effect for about forty-five minutes.
6. Finally, panel members filled out a "posttest" questionnaire in which they were asked the same questions contained in the pretest questionnaire.

In short, the project had the opportunity to examine respondents' views on solid waste disposal and possible global warming before and after they learned more about the issues, their causes, their possible effects, and the costs, trade-offs, and sacrifices that were involved in their possible solutions. In analyzing the two sets of views, we focused on the types of changes that did and did not occur, the reason for the change, and what they revealed about the public's more general response to issues of scientific complexity.

As part of our analysis, we wanted to compare the views of the panel respondents with the views of leading scientists. How close together or far apart were the public and experts? We sent a lengthy questionnaire, using many of the same items asked of the panel respondents, to 1,620 of the country's leading scientists. Four hundred and eighteen scientists responded, a return rate of just under 26 percent.

These data, the findings of the Citizen Review Panels and the responses on the scientist's questionnaire, are the basis for the three volumes that comprise *Science and the Public*.

Volume I focus on the public's response to scientifically complex issues in general. It attempts to answer the question at the heart of the project: How does the public understand and analyze policy questions involving elements of scientific and technological complexity? Volume II reports on findings related to the disposal of solid waste. Volume III reports on views on the threat of global warming.

Executive Summary

The Research Method

Over a three week period in September and October, 1989, a panel of 402 people from four metropolitan areas (Hartford, Nashville, Chicago and Los Angeles) chosen to represent a cross section of the population of the U.S. was brought together in groups of about 50 for three-hour sessions in which they: a) filled out a lengthy questionnaire (the pretest) about the disposal of solid waste and the threat of global warming; b) watched a fifteen minute film made by Public Agenda about the issue of solid waste disposal; c) broke up into groups of about 12 to discuss the issue for about thirty minutes under the guidance of a Public Agenda staff moderator; d) reconvened (after a short break) to watch a second film about the threat of global warming; e) again broke up into small groups to discuss that issue for about 45 minutes; and f) filled out a second questionnaire (the posttest) which included all of the items asked in the first questionnaire.[1]

1. The panel accepted the reality of the solid waste disposal problem and the need for people like themselves to sacrifice personally in order to deal with the issue BEFORE the session began, a point of departure that is unusual in terms of most national problems.

When it comes to many pressing national issues (including energy and air pollution, for example), large segments of the public tend to lay the blame on scapegoats (such as "big oil companies") or to deny that dramatic lifestyle changes (such as reducing automobile emissions by driving less) may be required. But with solid waste, the 402 respondents did not try to use business as a scapegoat; they did not deny the existence of the problem or suggest that it was essentially the result of government waste and inefficiency; and they did not want to postpone action in the hope that scientists would come up with a technological (i.e., miracle) answer. Rather the group accepted the reality of the problem, acknowledged that it basically stems from the way we live, and felt that much, if not most, of the burden for dealing with solid waste should fall on the citizenry.

2. While each of the study's four sites faces an acute solid waste crisis, none has an area-wide, mandatory recycling program in effect. But respondents in each site overwhelmingly favored mandatory recycling that would REQUIRE people to sort their trash.

In brief, the study suggests that many government officials and political leaders may have seriously underestimated the public's willingness to assume responsibility for this issue. Even before the intervention, the panel expressed overwhelming support in each of the four sites for mandatory recycling in which people would be required to separate cans, glass and newspapers from other trash (89 percent). Indeed, 59 percent favored immediate implementation while an additional 30 percent wanted to phase it in. Large numbers were also willing to accept other inconveniences such as:

- requiring people to take potentially hazardous materials to drop-off centers, 86 percent;
- paying a five cent deposit on bottles and cans, 85 percent;
- requiring publishing companies to use recycled paper even if that would increase the cost of newspapers and magazines, 80 percent;
- imposing a fee on nonrecyclable packaging even if that would raise prices and mean a slight increase in inflation, 65 percent;
- providing incentives to businesses that use recycled paper even if that means giving "tax breaks" to major corporations, 65 percent;
- requiring people to sort their garbage into five parts, 63 percent; and
- requiring companies to recycle paper and cardboard even if some companies would close and some workers would lose their jobs, 56 percent.

3. As they came to understand the issue more clearly, most panel members favored an integrated solid waste disposal system that would include the use of incinerators and landfills as well as source reduction and wide-scale recycling.

While the panel initially expressed considerable reservations about the wisdom of building more incinerators and landfills, support for both increased after the group learned more about the issue and as long as both were part of an integrated solid waste disposal system. However, the group's willingness to build and rely on incinerators and landfills was conditional, and depended on the institution of wide-scale, mandatory recycling. In order, the solutions preferred by the panel were:

- recycling,
- source reduction,
- incineration, and
- landfills (the group's clear choice as the option of last resort).

4. The panel insisted that all new incinerators and landfills be made as safe as possible, regardless of any additional costs.

In addition to mandatory recycling, the panel's willingness to construct new incinerators and landfills depended on two other conditions: first, that incinerators and landfills be built away from populated areas; second, that incinerator and landfill safety be an absolute top priority, even if that meant a significant increase in the costs of construction and operation of both. Indeed, we told the respondents that any new landfills or incinerators would be built using state-of-the-art pollution control technology, and literally not one of the 402 respondents asked how much such technology would add to the costs or how much could be saved if we compromised even slightly in this area.

5. In addition to the citizen panel, we interviewed 418 of the country's leading scientists and asked them the same questions about this issue. Apart from comparatively minor differences over which mechanisms to use (i.e., compared to the panel, the scientists were more interested in taxing disposable products and less interested in banning them), the scientists' views about how to deal with solid waste were similar to those of the panel, especially as expressed in the posttest.

The scientists' preferences for disposing of solid waste were quite consistent with the panel's views. For example, while there was broad support among the scientists for recycling, there was also broad support for source reduction as well as incineration; like the panel, the scientists favored an integrated system for disposing of solid waste that would start with mandatory recycling and include source reduction, along with incinerators and landfills. However, when it came to the implementation of a particular solution such as discouraging the use of disposable products, the scientists were more inclined to favor a tax while the panel was more inclined to favor a ban or regulation.

Source Reduction

1. After learning more about the problem of solid waste disposal, a large majority of the panel favored requiring manufacturers to reduce the amount of packaging they use (or what is known as source reduction).

There are four ways to deal with solid waste: it can be recycled, incinerated, put it in a landfill, or the total amount of waste can be reduced. Since this last method, called source reduction, reduces the dimension of the problem and actually precedes the disposal issue, we began the film and discussion with it.

In the film respondents were told that an average American throws away about three and a half pounds of trash each day, or about twice as much as someone in Germany or Japan. They were first asked how to deal with the solid waste disposal problem by considering various ways to reduce the amount of garbage we create in the first place. The group was asked about requiring manufacturers to reduce packaging, as well as proposals to discourage people from using various disposable products such as pens and razors, paper napkins, and styrofoam cups. The film then presented various arguments for and against source reduction.[4] The pro arguments included the fact that source reduction would reduce the amount of garbage to be disposed of, would conserve natural resources, and would reduce the cost of disposing of excess trash. Arguments against this option were that it would be very inconvenient, it might lead to layoffs at companies that make disposable products, and that these requirements would be hard to enforce.

In the pretest, before learning more about the problem of solid waste disposal, 43 percent of the panel said manufacturers should be required to reduce the amount of packaging they use even if that meant creating a new government bureaucracy to enforce such requirements. After seeing a film that described the solid waste problem and after discussing the issue at some length, support for this idea rose by 29 percentage points, with nearly three in four (72 percent) in the posttest saying they wanted either to implement immediately or phase in such requirements. (See Table 1.)

In addition to creating less trash and thereby helping to relieve the solid waste problem, source reduction was supported for several reasons. Respondents said that current packaging is often:

- Unnecessary;
- Overly expensive;
- Wasteful of resources; and
- Deceptive to consumers.

Respondents favored source reduction for a variety of reasons.[5] First, a number of them said that much packaging is just not necessary. A woman from the Hartford area said, "The packaging for a child's toy is ridiculous. It's for visual purposes. People say, 'It's big and it's nice, let's buy it!' But there really is no reason for [such large packaging]." A man from Hartford said, "When I was a little boy, I would go to the store and I would take a little dipper to get the candy and then put it in my pocket. Now they wrap it up two or three times, and it takes half-an-hour to get it open. We ought to get back to the basics, and get rid of [so much] paper." A man from Los Angeles said, "There is so much plastic wrapping on the outside, you can't even tell whether you want it or not."

While the film did not specifically mention drugs or medicine, a few people suggested that certain products such as drugs and over-the-counter medicine are heavily packaged to prevent tampering. But others disagreed. A man from Nashville said, "There's more packaging on small, over-the-counter drugs than there actually is product [in the package]. They put it in a bottle and a box and a sealed wrap." Finally, a few people suggested that less packaging would mean added convenience for consumers. "I'd prefer smaller packaging not only because of the ecology," a woman from Nashville said, "but also [to reduce] the inconvenience of certain items you have to store. You have a storage bin full of boxes, I would just prefer the smaller packaging." A Los Angeles area woman echoed this view saying, "I can't fit [most cereal boxes] in my cupboard at home."

> ***"I'd prefer smaller packaging not only because of the ecology, but also [to reduce] the inconvenience of certain items you have to store."***
> *--Nashville Woman*

A second criticism of current packaging involved cost. A number of people felt that excess packaging drove up costs and suggested that setting limits on packaging might lead to lower prices. A Los Angeles man said, "I think that if manufacturers reduced the amount of packaging [they use] on various items, that would reduce their overhead." Occasionally someone argued that what other respondents called excess packaging was actually necessary. A Nashville man said, "These packages, the way they are now, protect the product. Dolls and train sets, for example, have to be packaged this way so they won't get damaged during shipping." But a Los Angeles woman summed up the feelings of many when she said, "I think the packaging sometimes costs more than the product."

"I think the packaging sometimes costs more than the product."
--Los Angeles Woman

A third reason why respondents wanted to require less packaging was to conserve natural resources. A man from Chicago voiced a commonly heard view when he said that packaging limitations "would cut down on cutting down trees or whatever the package is made out of." A woman from Hartford said that current packaging is "an awful waste." She added, "It's ridiculous! You have all that paper [and] you could have packaged four items using the same amount of material."

Finally, many respondents favored packaging limits because they felt that current practices are designed to fool consumers. A Nashville woman said that manufacturers "try to give customers an optical illusion that bigger is better, and that you get more for your money." She named potato chips as an example, saying that manufacturers "could put them in airtight bags and make [the package] half the size." A woman from Los Angeles expressed a similar thought about breakfast cereal. "Each company seems to make their box bigger," she said. "They want to be the one that stands out the most." A man from Hartford suggested that excessive packaging is often part of a deliberate marketing strategy designed to maximize sales. "Most of the time, [manufacturers] have these large packages so [that their products] stand out from the others." A Chicago man expressed a similar view. "The reason they put it in a big package," he said, "is to get your attention. It's an advertising gimmick."

A few people argued that using an eye-catching package in order to maximize sales was a sound business strategy. For example, a woman from Los Angeles said that manufacturers "might argue from a sales point of view that if a [product] stands out over others, the others are not so noticeable and people will stop and look at [the one that stands out]." But another woman in that group suggested, to general agreement, that even if smaller packaging did lead to reduced sales, manufacturers could put the money to other uses. "If companies reduce the size of the packages," she said, "they would save more money and then they could advertise [to offset any loss in sales]. They wouldn't have to have such big boxes if they advertise enough."

However, not everyone shared these sentiments. Some, such as a woman from Los Angeles, had mixed feelings about source reduction. "As a parent and a homemaker, I like it that the individually wrapped cheese slices do stay fresher for longer." A number of others argued that source reduction was not a viable alternative for practical reasons, saying it would be impossible to enforce packaging requirements. A man from Hartford said, "I think we have too big a bureaucracy now, and [this proposal would] just create more bureaucracy." Others mentioned the importance of packing televisions, computers and other electronic equipment in shock-absorbent padding. A man from Los Angeles wondered whether this option would significantly address the overall problem of solid waste disposal. "I wonder how big a percentage of [solid] waste we could reduce by changing the packaging," he said. "I don't think it would be that great -- maybe one percent?" But these were the views of a minority of panel members. As noted, by a posttest margin of 72 percent to 20 percent, the panel was in favor of requiring manufacturers to reduce the amount of packaging they use. (See Table 1.)

2. When asked about specific disposable products, the panel expressed more support for banning or taxing styrofoam than for any other product.

Among a list of disposable products, including plastic bags, disposable diapers and paper products, styrofoam was the most popular choice to ban or tax. In the posttest, two-thirds of the panel (66 percent) supported banning (45 percent) or taxing (21 percent) styrofoam products. However, support for reducing styrofoam did not increase significantly from the pretest to the posttest. (See Table 2 and Chart 1.)

A number of respondents said styrofoam is not an essential product and could be replaced rather easily with paper products even though the moderators emphasized that replacing styrofoam with paper would do little to reduce the volume of solid waste. Several people singled out fast food restaurants as culprits. "Did you ever go to a fast food restaurant?" a Nashville woman asked. "They have a little styrofoam thing for this and a little styrofoam thing for that, and when you get through, you've had a little food to eat, but three bags of styrofoam cups and containers to throw away."

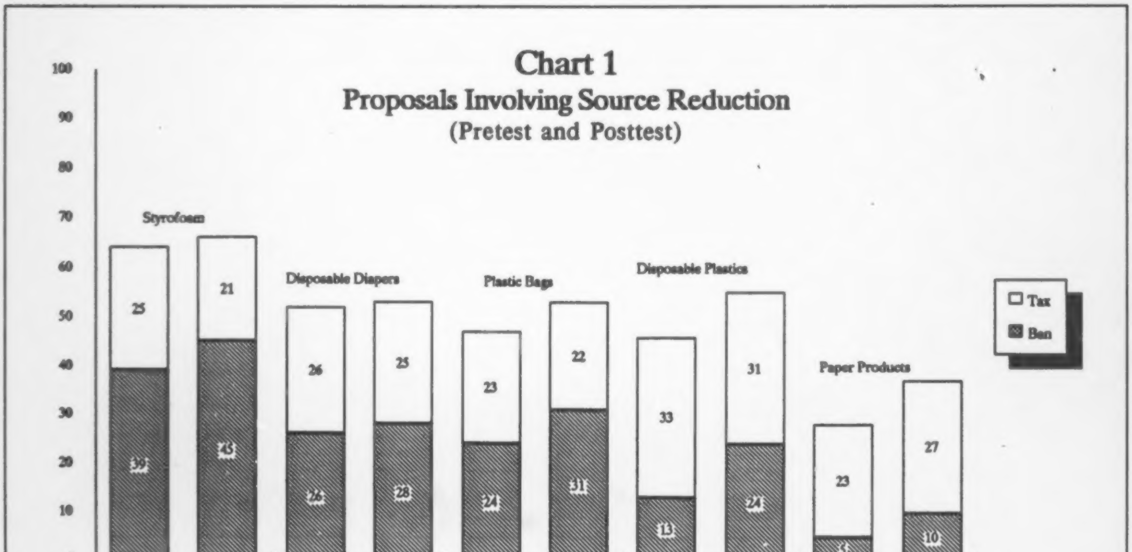


Chart 1

Proposals Involving Source Reduction

(Pretest and Posttest)

Other respondents wanted to reduce the use of styrofoam for reasons other than reducing the volume of solid waste, including concern about biodegradability and other environmental dangers. A man from Nashville said, "In an incinerator, paper products will burn. No problem. But with styrofoam, you get toxic fumes." Another Nashville area man said, "I understand that [styrofoam cups] contribute a lot to the destruction of the ozone."

But not everyone agreed that styrofoam could be easily replaced. One man said that items not protected by styrofoam were far more likely to break during shipment. A Los Angeles man echoed that thought, saying, "Radios [are packed] in very large boxes, and have styrofoam all around them. What would happen if you got one that's broken? You'd have to replace it." But opinions like these were in the minority. Most panel members said we could rather easily make do with less styrofoam.

3. While narrow majorities supported either a ban or tax on both plastic bags and disposable plastic products such as pens and razors, those in opposition often felt strongly about the issue.

A slim majority favored banning or taxing plastic bags and disposable plastic products. In the posttest, 53 percent said that plastic bags should be either banned (31 percent) or taxed (22 percent). Nearly the same number, 55 percent, wanted to ban (24 percent) or tax (31 percent) disposable plastic products such as pens and razors. (See Table 2 and Chart 1.)

In the film, the narrator pointed out that source reduction would be inconvenient. But a few people felt that reducing the use of disposable plastic products would not be difficult. A woman from the Los Angeles area said that using fewer plastic products would be only a temporary inconvenience. "We can get used to anything," she said. "I think we can get 'unused' to the plastic cups the same way we got used to them." A woman from Chicago said, "I have no problem with there being a tax on certain plastic products. How many plastic milk jugs do we throw away?"

However, and in marked contrast to how the panel felt about styrofoam, sizable minorities voiced strong opposition to taxing or banning plastic bags or disposable plastic products. Some mentioned convenience. For example, a Nashville woman said, "You are talking about getting rid of plastic bags. What are you going to use, paper bags? I like plastic bags. They are easier, more convenient, cleaner." A woman from the Chicago area expressed a similar view. "I have four children," she said, "and I like the convenience of plastic bags and disposables. It just fits into my lifestyle." A Los Angeles man acknowledged that Americans may be spoiled by using disposable plastic products but said he felt that "spoiling is not reversible."

"I have four children, and I like the convenience of plastic bags and disposables. It just fits into my lifestyle."
--Chicago Woman

Another focus of opposition centered around the cost of replacement products. A woman from Hartford said, "It's a huge expense to buy things that aren't disposable. It is very expensive to buy a pen that you don't throw away. Or a razor." A Nashville area man said, "I don't think banning these (disposable plastic products) is a solution. These

"We have a lot of people on fixed incomes who couldn't afford [to buy the more expensive replacement products]."
--Los Angeles Man

are cheap products. What is our alternative?" A man from Los Angeles expressed a similar concern, saying, "I think [a ban] would cause considerable hardship because prices will increase on everything. [Manufacturers are] making plastics that are cheaper, they're making disposables that are cheaper." And, he added, "We have a lot of people on fixed incomes who couldn't afford [to buy the more expensive replacement products]."

Finally, a number of people were opposed to a tax increase on any disposable product. A Los Angeles man said that such a tax was "a gimmick." He argued that proponents "say that if you put more tax on [a product], people won't buy this and won't buy that. But that's a lot of garbage," he said, implying that people would ignore the price rise and the tax would only provide additional revenue to the government. A Hartford man expressed a similar view, saying a tax on disposables "is just going to lead to more tax," not to appreciably reduced use of the products. A man from Nashville agreed. With a tax on disposables, he said, "we would just end up paying a higher price for the product and not get any real benefit out of [the tax]."

4. While a bare majority supported banning or taxing disposable diapers, a large number of respondents voiced nearly fierce opposition to the idea.

In the posttest, 53 percent of the panel supported banning (28 percent) or taxing (25 percent) disposable diapers. In addition to the solid waste problem, a few respondents cited the danger to ground water of putting used diapers in a landfill. A woman from Nashville said, "I think one of the biggest problems we have is disposable diapers." Several, including some older respondents, argued that they had used cloth diapers when raising their children, and that using cloth diapers and a diaper service was not much of an inconvenience. "I use cloth diapers," a woman from Hartford said. "And my mother used them on me." (See Table 2 and Chart 1.)

But others argued that disposable diapers had become a necessity and stressed that the busy schedules of young mothers, especially those who work, require that they use disposable diapers. A woman from Nashville said, "disposable diapers are such a convenience." A woman from Los Angeles said, "I could do without a lot of things but when it comes to [disposable diapers], I thought, 'Oh my word, now that's something different.' " A woman from Hartford said she had used cloth diapers until she went back to work, but then had no choice but to switch to disposables. Another woman from Hartford asked a practical question: "What day care center is going to take your kid with [cloth] diapers?" Other respondents mentioned that disposable diapers eliminate the need to store dirty diapers and therefore are more sanitary. Indeed, opposition to banning or taxing disposable diapers was often heated, with some panel members suggesting the public would never stand for it, and that it would be politically impossible to ban or tax this product.

Finally, we should note that most of the support for banning or taxing disposable diapers came from older respondents. In the posttest, 68 percent of those who were 65 and over favored a ban or tax on disposable diapers. Among those under 40, majorities opposed both a tax and a ban on disposable diapers. (See Table 3.)

"I could do without a lot of things but when it comes to [disposable diapers], I thought, 'Oh my word, now that's something different.' "
--Los Angeles Woman

"What day care center is going to take your kid with [cloth] diapers?"
--Hartford Woman

There was, however, virtually no difference in support between men and women for banning or taxing disposable diapers. In the posttest, 54 percent of the men supported a ban or tax compared to 53 percent of the women. Similarly, 39 percent of the men did not want either a ban or tax compared to 37 percent among women. (See Table 3.)

5. Before and after learning more about solid waste disposal, majorities opposed a ban or a tax on disposable paper products.

Even in the posttest, most of the panel, 51 percent, opposed both banning and taxing disposable paper products. Only 10 percent favored a ban while 27 percent favored a tax to discourage people from buying paper napkins, cups, and other paper products. (See Table 4 and Chart 1.)

Those in opposition argued that the convenience of these products made them essential. A woman from the Los Angeles area said, "What's going to replace paper napkins and cups? You're going to have to go back to cloth napkins, and washing a lot more times." A woman from Nashville expressed a similar view. "With my job," she said, "I get home late, and paper plates are great. I don't have time to do the dishes. It's nice not to have to do them every night." Others talked about how important some disposable paper products are to their lifestyles. A Hartford area woman said, "I have a two year old and I gave her a birthday party. Do you know how many cups little kids go through? They drink a little bit, throw [their cup] away, drink another little bit, throw it away -- that's a lot of cups [to have to wash out]!" A woman from Nashville said, "I'm single so it's much easier for me to go home, grab a paper plate, [use it and] throw it away."

However, there was a sizable minority who did favor reducing the use of paper products. In the posttest, 37 percent said we should either ban (10 percent) or tax (27 percent) disposable paper products to discourage people from buying them. A man from Hartford expressed the sentiments of a number of respondents when he said disposable products had spoiled Americans and made us "very lazy people" and that we needed to reduce our use of paper products to deal with the problem of solid waste. (See Table 4 and Chart 1.)

"I get home late, and paper plates are great. I don't have time to do the dishes. It's nice not to have to do them every night."
--Nashville Woman

Source Reduction: Scientists and the Public

1. The scientists felt that source reduction should significantly reduce the volume of solid waste. While the scientists were more likely to favor taxing disposables whereas the panel was more in favor of a ban, the level of support among the two groups was nearly identical when the two methods (ban or tax) are taken together.

Most of the scientists felt that source reduction should play a major role in reducing the volume of solid waste by the turn of the century. More than 80 percent of the scientists said source reduction should reduce the volume of solid waste by at least 10 percent, and a smaller majority (64 percent) said this approach should be used to reduce the volume by at least 20 percent. On average, the scientists said that source reduction should be used to reduce the amount of solid waste we produce by 25 percent. (See Table 5.)

Compared to the panel of citizens, the scientists were noticeably less willing to require manufacturers to reduce the amount of packaging they use. As noted, in the posttest 72 percent of the panel favored requiring manufacturers to reduce the amount of packaging they use even if that would mean creating a new bureaucracy. Among the scientists, 51 percent said they favored this approach, with most saying it should be phased in over the next decade instead of implemented immediately. In their comments on the questionnaire, several scientists questioned the wisdom of this approach. For example, one wrote, "More bureaucracy is the last thing we need." Another wrote that "Bureaucracies don't solve problems, you can't pass laws to cure ills." A third wrote that we already "have the EPA, [we] don't need a new bureaucracy." (See Table 6.)

At the same time, support for taxing disposable products was noticeably higher among the scientists than among the panel. For example, 46 percent of the scientists favored taxing disposable plastic products (compared to 31 percent among the panel in the posttest) and 45 percent of the scientists favored taxing plastic bags (compared to 22 percent in the posttest). These differences may be explained by four factors:

- At least some public resistance to any kind of new taxes;
- The fact that the scientists were seemingly more concerned about a new bureaucracy;
- Greater sophistication on the part of the scientists about the elasticity of demand; and
- The fact that 96 percent of the scientists surveyed had completed at least some graduate school while 82 percent had a Ph.D., thus making it likely that they are in above average income groups and thus less sensitive to marginal tax increases than the average person. (See Table 2 and Chart 2.)

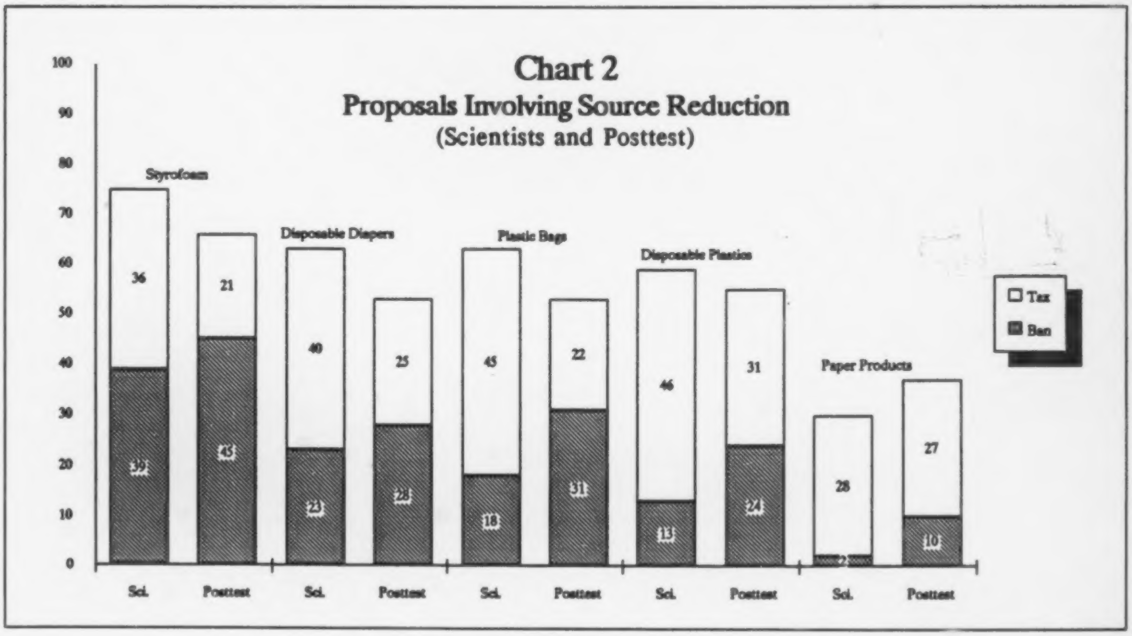


Chart 2
Proposals Involving Source Reduction
(Scientists and Posttest)

However, when the two methods for reducing the use of disposable products are taken together, the level of support for either a ban or a tax is about the same among the panel and the scientists. For example, 66 percent of the panel favored either a tax or ban on styrofoam compared to 75 percent among the scientists. And 55 percent of the panel favored either a tax or ban on disposable plastic products compared to 59 percent among the scientists. The pattern did not change even with disposable paper products such as napkins and cups where both the panel and the scientists opposed a ban or a tax. (See Table 2 and Chart 2.)

Recycling

1. Even before learning more about the problem of solid waste disposal, respondents favored implementing wide-scale, mandatory recycling that would require everyone to sort their trash.

State and local officials faced with the task of safely disposing of solid waste may be heartened to learn that the panel of 402 citizens, chosen to represent a national cross section, showed a strong willingness to enact wide-scale, mandatory recycling even before learning more about the problem. In the pretest, 89 percent of the panel said everyone should be required to separate garbage into three parts (newspapers, cans and glass, and everything else) even if that would be inconvenient. Before the intervention, nearly two-thirds, 59 percent, favored immediate implementation and 30 percent wanted to phase in such requirements over the next ten years or so. National polls have found similar results. A November 1989 study conducted by the *Los Angeles Times* found that 93 percent of the respondents were willing to separate their trash into papers, bottles, and aluminum cans to aid in waste disposal. (See Tables 7 and 8 and Chart 3.)

In addition, a large majority in the pretest, 86 percent, wanted to require people to take potentially hazardous materials such as used batteries and old cans of paint to centrally located drop-off centers, with 58 percent favoring immediate implementation. And 85 percent favored imposing a five cent deposit on bottles and cans to encourage recycling even if that increased the price of soda and beer, with 59 percent favoring immediate implementation. It is important to note that support for these alternatives was not a product of increased awareness. Respondents were just as willing to support these measures before learning more about the problem as they were afterwards. (See Table 7 and Chart 3.)

The film defined recycling as "reusing the trash we produce." The narrator said: "Sometimes we reuse glass to make new glass bottles. Or sometimes we reclaim trash to make other products. For example, we shred plastic bottles and use the reclaimed plastic to make construction materials or bedding." The film then presented some of the arguments for and against recycling. Respondents were told that advocates say it conserves natural resources, poses little threat to the environment, and would create jobs, especially for unskilled workers. On the other hand, the film pointed out, opponents argue that recycling is very inconvenient, might be impossible for the elderly and handicapped, and would be hard to enforce, especially in big cities.

> ***"In our generation [solid waste] is not that bad, but in ten years or so it will be. We should recycle everything we can or we will bury ourselves."***
> *--Hartford Man*

Respondents supported recycling for three reasons. They saw it as:

- an effective way to reduce solid waste;
- environmentally safe; and
- a measure that would create jobs.

Many respondents were especially concerned about the long term and saw recycling as one way to address it. A man from Nashville said, "The more separation (of trash for recycling), the better. We need to realize the problem that is coming upon us." A man from the Hartford area said, "In our generation [solid waste] is not that bad, but in ten years or so it will be. We should recycle everything we can or we will bury ourselves." Others suggested that as the problem grew, so would public awareness. A Los Angeles woman said, "The people I know don't really think [solid waste] is that much of a problem. I don't think they realize the seriousness yet."

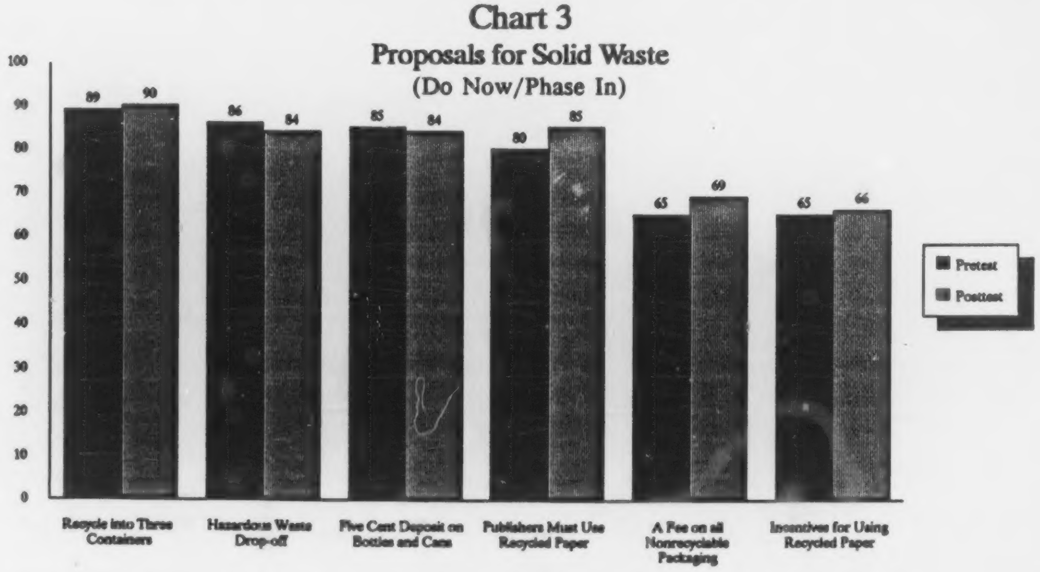


Chart 3

Proposals for Solid Waste

(Do Now/Phase In)

Respondents also liked recycling because they saw it as environmentally benign. A man from Nashville said, "When you try to solve something [like the solid waste problem], you have to realize whatever you do is going to produce some bad side effects. But mandatory recycling to me seems the best thing because it has fewer bad effects." A woman from that city said she would accept some inconvenience to have a safer disposal alternative. "Recycling might be inconvenient," she said, "but it's safe." A woman from Hartford suggested that recycling would conserve natural resources. "To recycle and reuse our resources is important," she said.

> ***"When you try to solve something [like the solid waste problem], you have to realize whatever you do is going to produce some bad side effects. But mandatory recycling to me seems the best thing because it has fewer bad effects."***
> *--Nashville Man*

A third reason why respondents supported this option was the belief that large scale recycling would create new jobs, especially for those with few skills who are otherwise hard to employ. Recycling, they pointed out, would create entry-level jobs because someone would have to crush the glass, bind the paper, separate the glass, etc. A man from the Chicago area said, "Wouldn't recycling create jobs for people? There are a lot of unskilled workers who could work with recycling." A Nashville man said, "There's jobs to be made for people who don't have jobs." A woman from Nashville said that even voluntary recycling has economic benefits for certain people. "I work at a Senior Citizens Center," she said, "and [the seniors] bring all their newspapers and get $5.00. Not only does it give them something to do, but they make money on the side."

Respondents clearly understood that separating their garbage into three containers would be inconvenient, but said that was an acceptable trade-off. A man from Los Angeles said experience proved people would comply. "For those of us who can remember the Second World War," he said, "we had recycling at that time. And it worked very well. There's no reason why we couldn't do it again." A Chicago area man recounted a similar experience. "Years ago," he said, "Oak Park (a Chicago suburb) was recycling. We had to have three different containers. We all became accustomed to it, and it wasn't that hard. We had three different garbage cans." A man from Nashville suggested that people in other countries put up with the inconvenience and that Americans will too. "We [Americans] complain about [not having enough] space -- those people [Europeans] are jammed together. And not only do [Europeans] have to separate your glass and everything else, you have to drop the brown bottles here, the green bottles there, and the white bottles there." A woman from Hartford said, "People would get used to it, just like they get used to everything else."

"You [have to] take newspapers one place, cans another place. You have to run all over town to take the things where they're supposed to be."
--Nashville Woman

The panel recognized that mandatory recycling would be difficult or even impossible for some. A Nashville woman asked, "What about handicapped people or blind people? How could they do it?" A man from Hartford agreed, saying, "I think [mandatory recycling] would be hard for the handicapped." But others suggested that these would not be insurmountable problems. A woman from Los Angeles said the elderly knew all about the inconveniences of recycling because "they were raised with it." Another woman from that city said, "About the handicapped and elderly – you're looking at two groups of people who are trying to maintain their dignity and prove they're as capable as other people. I agree that there are some handicapped people [for whom] it would be impossible. But [the handicapped and elderly] go the extra mile." Finally, one elderly respondent in a wheelchair said he thought the handicapped and the elderly would find it no harder than anyone else to separate their trash, and he knew this to be true from personal experience.

A handful of respondents raised other concerns. A woman from Hartford worried about people who live in apartment buildings or in cities where space is scarce. Others said that trash separation would be hard to police. A man from the Los Angeles area said, "The problem with mandatory recycling is that if you have a homeowner who isn't recycling, they are going to get caught. But if you live in an apartment with 300 other people, are you going to have a guard standing by the dumpster seeing who is recycling and who is not?" A man from Nashville was concerned about the government enforcing these requirements. "The less government interference in my life, the happier I am," he said. But the vast majority were willing to accept these trade-offs. For example, a woman from the Los Angeles area noted that while recycling might be hard to police, we should nevertheless implement the option. "There is always going to be a degree of people who are going to abuse the situation," she said, "but for the benefit of all, most people will comply [with the recycling requirements]."

We should emphasize that the mandatory recycling proposal presented to respondents featured curbside pickup of sorted trash, and "conveniently located" drop-off centers for potentially hazardous materials. And so the panel's willingness to recycle should be understood in that context. For example, a woman from Nashville said she and other residents would recycle only if it were convenient. Right now, she added, her community has a voluntary recycling program but participation is too difficult. "You [have to] take newspapers one place, cans another place," she said. "You have to run all over town to take the things where they're supposed to be."

We should also note that nearly two-thirds of the panel (64 percent in the posttest) said they would favor requiring people to separate their trash into five containers (newspapers, bottles and cans, plastics, compostable food and yard waste, and everything else); of that group, 30 percent said this should be implemented immediately and 34 percent wanted to phase it in over the next decade. But while many respondents said people would adapt to a five separation system with little difficulty, a sizable posttest minority, 28 percent, opposed this proposal, with many saying this was too much to ask. Separating trash into so many containers is "going a little overboard," said a man from Los Angeles. A Nashville area man said, "Recycling the newspaper is one thing. You take the Sunday paper and put it on the side. But think of all the paper you use during the day. It would be a drag to separate it out." A woman from the Chicago area said, "It's hard to jump into water that deep right away. I can see something phased in a lot more easily. If you become accustomed to three [separations], then five or six doesn't sound quite so bad." (See Table 9 and Chart 4.)

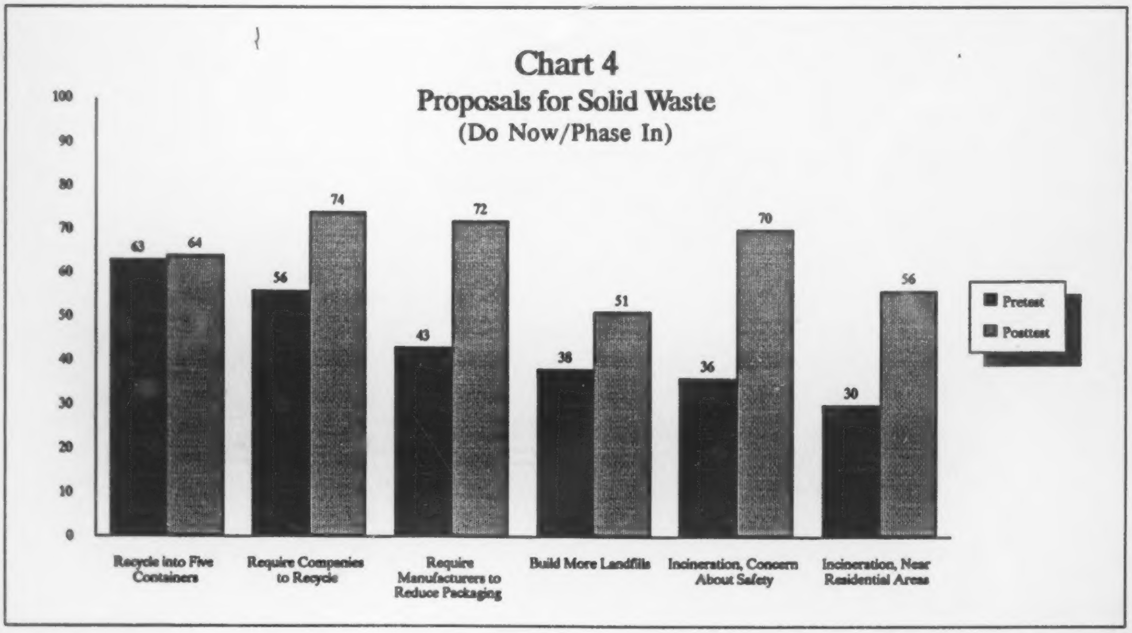


Chart 4
Proposals for Solid Waste
(Do Now/Phase In)

2. Respondents also wanted to phase in a variety of other recycling measures even before the intervention.

Respondents broadly supported a number of other recycling proposals with large majorities wanting to implement them immediately or phase them in. Even before the intervention, upwards of two-thirds favored measures that would increase the demand for recycled paper, with 65 percent in favor of giving tax incentives to businesses that use recycled paper, and 80 percent in favor of requiring publishing companies to use recycled paper "even if that would increase the cost of newspapers and magazines." (See Table 10 and Chart 3.)

"I was involved with the Boy Scouts doing newspaper collection and just within the last several weeks the recycling company that took the paper notified us there was such a glut that they didn't want any more newspapers. This is going to be a real problem that we need to address [if we move to mandatory recycling]."
--Nashville Man

Support for such measures stemmed in part from recognition of an obstacle that many recycling programs across the country are facing: a glut of recycled paper. Some respondents spoke from personal experience. A man from Nashville said, "I was involved with the Boy Scouts doing newspaper collection and just within the last several weeks the recycling company that took the paper notified us there was such a glut that they didn't want any more newspapers. This is going to be a real problem that we need to address [if we move to mandatory recycling]."

After the intervention, respondents were also more willing to favor requiring companies to recycle paper and cardboard, even if that meant some packaging companies would close and some workers would lose their jobs. In the pretest, 56 percent wanted to do this now or phase it in; but as awareness increased, almost three-fourths, 74 percent in the posttest, favored this step. However, most of those in favor wanted to phase in the measure over the next ten years or so. (See Table 10 and Chart 4.)

3. The results also suggest there will be broad public support for using packaging that is recyclable; in the pretest, 65 percent supported a fee on nonrecyclable packaging.

When asked in the pretest what they would do if they knew a certain food or beverage container could not be recycled, 47 percent said they would buy a comparable product in a recyclable container while 27 percent said they would continue to buy the product they normally buy. But after learning more about solid waste, respondents said they were inclined to change their buying habits to boost the amount of recyclable packaging that is used and thereby ease the problem. In the posttest, 64 percent said they would buy a comparable product in a recyclable container, a 17 percentage point increase; and only 20 percent said they would continue to buy the product as they normally did. This result may be of particular interest to manufacturers and environmentalists because of concern that people may think that products packaged in recyclable material are inferior, and may therefore be less apt to buy them. Our results suggest the opposite is true; even in the pretest, respondents said they were more likely to buy products that are packaged in recyclable material; in the posttest, after learning more about the problem of solid waste disposal, the number expressing this view increased to nearly two in three. There was also broad support for phasing in a fee on nonrecyclable packaging with more than two-thirds, 69 percent in the posttest, favoring this approach. (See Tables 11 and 12 and Chart 3.)

4. The panel acknowledged that the solid waste problem stems from the way we live and therefore felt that most of the burden for addressing it should fall on people like themselves. In general, the group did not resort to wishful thinking, or view government or big business as scapegoats.

When it comes to many national issues (such as energy and air pollution to take two examples), many members of the general public tend to lay the blame on scapegoats (such as "big oil companies") or to deny that lifestyle changes may be required (such as reducing automobile emissions perhaps by driving less). But in this case, respondents did not try to use big business as a scapegoat; they did not say companies, manufacturers, or businesses should shoulder all or even most of the burden; they did not deny the existence of the problem or suggest that it was essentially the fault of government inefficiency; and they did not want to postpone action in the hope that scientists might come up with new technological (i.e., miracle) answers. Rather, the group accepted the reality of the problem, acknowledged that the solid waste problem stems from the way we live, and therefore felt that much, if not most, of the burden for dealing with it should fall on the citizenry.

Of the eight recycling proposals presented to the group, four involved personal sacrifices (such as a price increase and inconvenience). Of those, three received support from upwards of 84 percent in the posttest, and nearly two-thirds said they would phase in the fourth option: separation of trash into five containers. The intervention as well as the questionnaire were designed to help respondents see the trade-offs and costs of each strategy. And while respondents recognized that certain sacrifices might be especially hard on the elderly or the handicapped or people who live in apartments, and while they saw that enforcement would mean a new bureaucracy and might be difficult in some cases, they nevertheless supported these measures overwhelmingly.

"It's time we take responsibility for what we cause and the trash we make. Even if it is a pain." --Nashville Woman

The following comment from a Nashville area woman summarized the feelings of many. "It's time we take responsibility for what we cause and the trash we make," she said. "Even if it is a pain." A man from that city even saw investment opportunities. "If we were forced to recycle," he said, "I guarantee you there are people out there who would invest money to put out new garbage compactors where you'd have four different slots and you just drop [the garbage] in. You'd have all kinds of new products that would make [recycling] a whole lot easier."

Finally, the breadth of the panel's support for recycling is demonstrated by the large majorities that favored each of the eight different recycling proposals to deal with solid waste. In the posttest, upwards of 60 percent favored each one, regardless of the sacrifice. The panel was asked to consider options ranging from a fee on nonrecyclable packaging to a five cent deposit on cans and bottles to a requirement that people take potentially hazardous material to a centrally located drop-off center. In every case, large majorities wanted to take the step immediately or phase it in gradually. This overwhelming support suggests that the public is both seriously concerned about the amount of trash the country must dispose of, and willing to make personal sacrifices and lifestyle changes in order to do so. (See Tables 7, 9, and 10 and Charts 3 and 4.)

> ***"I guarantee you there are people out there who would invest money to put out new garbage compactors where you'd have four different slots and you just drop [the garbage] in. You'd have all kinds of new products that would make [recycling] a whole lot easier."***
>
> *--Nashville Man*

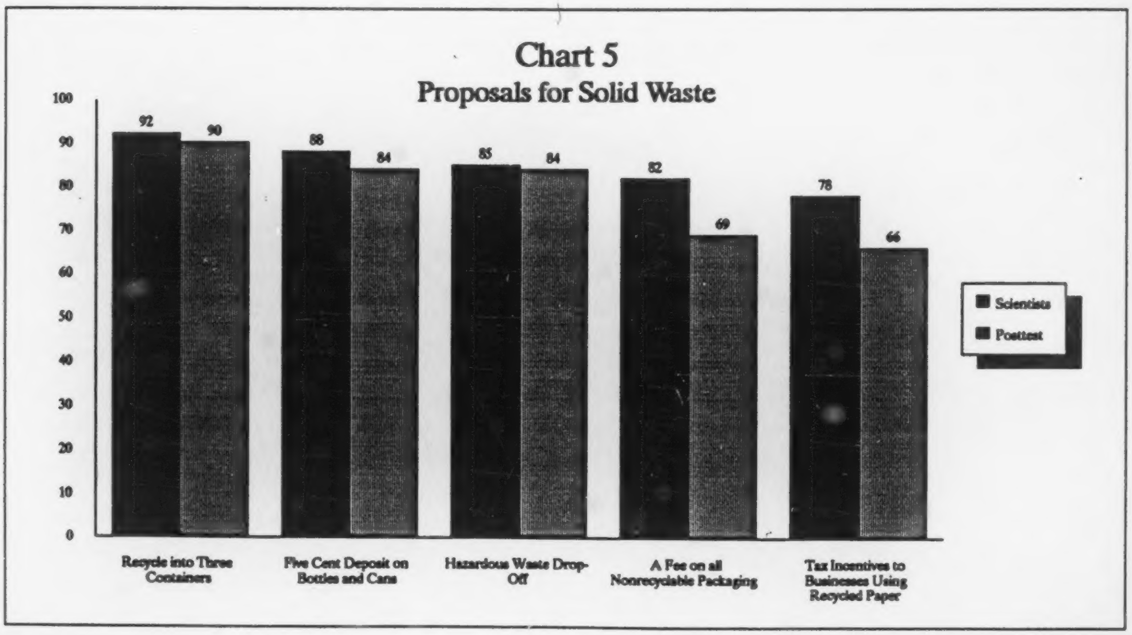


Chart 5

Proposals for Solid Waste

Recycling: Scientists and the Public

1. Like the panel, scientists expressed broad support for recycling. The only significant difference involved how to promote recycling, with the scientists more in favor of economic incentives while the panel showed more support for requirements. But even there, the differences were differences in degree.

As with the citizen panel, a vast majority of the leading scientists interviewed favored a variety of measures to promote recycling. For example, 92 percent of the scientists favored requiring everyone to separate garbage into three parts, with 60 percent supporting immediate implementation. Some expressed concern about the transition, with, for example, one scientist writing we should phase in implementation "not because of the inconvenience, but because we're not set up to use the recycled material." (See Table 13 and Chart 5.)

In addition, 88 percent of the scientists wanted to impose a five cent deposit on all bottles and cans, with a larger number, 70 percent, calling for immediate implementation. Indeed, one scientist noted that a "ten cents [per bottle deposit] is already being done in Michigan." Finally, 85 percent of the scientists wanted to require people to take potentially hazardous materials such as used batteries and old cans of paint to drop-off centers. As noted above, all three of these measures enjoyed support from upwards of 83 percent of the panel of citizens. (See Tables 7 and 13 and Chart 5.)

As was true with source reduction, the scientists were more likely to favor economic incentives such as tax incentives and fees to encourage recycling, while the panel was more likely to favor requirements. However, these were essentially differences in degree since large majorities among both groups favored both taxes and requirements. For example, 78 percent of the scientists favored giving tax incentives to businesses that use recycled paper compared to 66 percent of the panel in the posttest. On another issue, 85 percent of the panel in the posttest wanted to require publishing companies to use recycled paper compared to 75 percent among the scientists. (See Tables 10 and 13 and Charts 5 and 6.)

Finally, the scientists were optimistic that recycling could make a significant dent in the solid waste problem. When asked what percentage of solid waste should be recycled by the year 2000, 79 percent of the scientists said we should recycle at least one-fifth of all solid waste, while 50 percent said we should recycle at least 30 percent of our trash. On average, the scientists felt we should recycle just under one-third (32 percent) of our solid waste.[6] (See Table 14.)

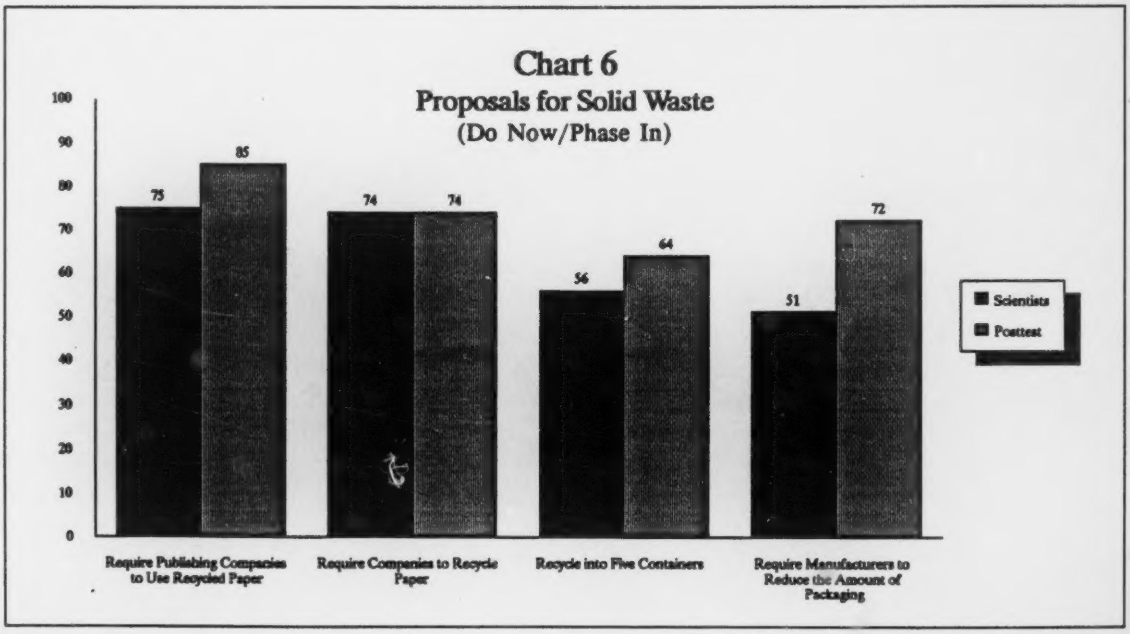


Chart 6
Proposals for Solid Waste
(Do Now/Phase In)

Incineration

1. Initially, respondents expressed a great deal of uncertainty about whether to build more solid waste-to-energy incinerators. But as they learned more about the problem of solid waste, respondents' support for building incinerators increased sharply.

In the pretest, many respondents were unsure about whether we should build more solid waste-to-energy incinerators. As with source reduction, recycling, and landfill, we asked the group to consider incineration in light of different trade-offs or risks. Specifically, the group was asked if it would favor building more incinerators in view of the following: first, that some would have to be located near residential areas; and second, that some scientists say incinerators pose a danger to public health.

When asked if they wanted to build more incinerators "even if some scientists say they pose a danger to the public," respondents split in the pretest with 36 percent in favor and 33 percent opposed. When asked in the pretest if they wanted to build more incinerators "even if that means locating them near residential neighborhoods," respondents were opposed; only 30 percent favored and 50 percent opposed building incinerators when given this trade-off. We should note that we did not ask respondents about their own neighborhood, but about residential areas in a general sense. (See Table 15 and Chart 4.)

On both items, however, large numbers of respondents were not sure. Nearly one in three (31 percent) were not sure whether to build if some scientists say they are dangerous and 20 percent were not sure if they would support building an incinerator if it was located near a residential neighborhood. Comments in the discussion suggested that respondents' uncertainty stemmed from the fact that many were unfamiliar with incinerators and reluctant to use any technology when questions have been raised about its safety or its effect on quality of life. (See Table 15.)

The film and discussion reviewed the two principal points of view about incinerators. Following the format used for each of the solid waste options, the film briefly described what a waste-to-energy incinerator is, then outlined the main arguments voiced by those in favor of and opposed to building more incinerators. Those in favor, the film said, argue that more incinerators should be built for three reasons: they are capable of burning up to 90 percent of our trash, thereby greatly decreasing our dependence on landfill; they are very convenient as they do not require people to sort their trash; and as they burn the trash, they generate electricity that can be sold to neighboring communities.[7]

The film then presented arguments voiced by those who oppose building more incinerators. Opponents' first concern, the film said, is that even with tall smokestacks and the most modern air pollution equipment, incinerators will be difficult to locate because no one wants to live near one. The narrator then said:

> "A second objection is voiced mainly by a small number of scientists, and it involves the safety of incinerators. While most scientists feel that a properly run incinerator is pretty safe, other scientists argue that incinerators are dangerous, too dangerous for us to build and rely on.[8] First, these scientists say, even the newest, most modern incinerators can give off dangerous, cancer-causing emissions if the temperature is not kept hot enough. Second, they argue that the ash left after burning the trash often contains toxic chemicals and that this ash is hard to dispose of safely."

In the discussion, the moderators reviewed these arguments, suggesting that the way scientists feel about incinerators is similar to the disagreement among doctors about the safety of eating red meat or sugar. In each case, the moderators said, experts can be divided into three groups: a comparatively small number who foresee serious trouble if we rely on incinerators (or if people eat a lot of red meat or sugar); a majority who hold a more moderate view and who do not believe incinerators (or red meat or sugar) present much danger, if any; and a third group, what the moderators called "a fair number" of scientists (or doctors), who simply are not sure which view is correct. The moderators said that, as with other threats to health, experts will eventually reach consensus about what is safe and what is not; but in the meantime, the group was told, those we elect must decide what to do in the face of this uncertainty, and that is what they, the respondents, were being asked to do – decide whether or not to build more incinerators in view of the uncertainty among scientists.

Support for building incinerators increased dramatically after respondents considered the different solid waste options and the arguments for and against each one. The number in favor increased from 30 to 56 percent when the trade-off was that some incinerators would be located near residential neighborhoods. And the number in favor of building more nearly doubled (from 36 to 70 percent) when the trade-off was that "some scientists say they pose a danger to the public." (See Table 15 and Chart 4.)

"I'd rather live by an incinerator than by a nuclear power plant. No system is perfect, so I think we should do the best we can."
--Los Angeles Man

Most of those who said the risks from incinerators were negligible gave the issue serious consideration, often weighing several factors including the risks from landfill and other threats. For example, a Los Angeles area man said, "I'd rather live by an incinerator than by a nuclear power plant. No system is perfect, so I think we should do the best we can." A Hartford woman implied that life is full of risks when she asked, "How many people live in a perfect world?" A handful of respondents dismissed the entire issue, saying that society was overly concerned about certain risks and dangers. "Scientists say right now that there's enough carcinogens in our drinking water that it's going to cause us lots of cancer," said a man from the Los Angeles area. "We're all going to get cancer anyway, so what the heck." However, the vast majority of respondents did not share this view, and gave the issue of incinerator safety thoughtful consideration.

2. The group's decision to build more incinerators included an implicit willingness to live with risk and was based on four reasons.

Respondents favored building more incinerators for four reasons:
- They were felt to be an effective way to reduce solid waste;
- They generate electricity;
- They are a technology with which other communities and countries have had a lot of experience; and
- Incinerators were preferable to the remaining alternative -- landfills.

After the intervention respondents' concern about the entire solid waste issue increased and many looked to incineration as a way to significantly reduce the volume of trash. The more trash we incinerate, many said, the less we had to get rid of. Several respondents spoke of apartment building incinerators and how they reduce the amount of solid waste, turning it into ash. While the moderators pointed out that such incinerators were totally different from the option being proposed, respondents replied that they were using them to illustrate why they saw burning as an effective solution.

Respondents also supported incinerators because of the electricity they would generate. A number of people liked the idea that the electricity could be sold, thereby helping to offset costs while simultaneously providing power for nearby homes and office buildings. A woman from the Nashville area said, "I think incineration is a really good idea. We should convert more trash into electricity." A woman from the Los Angeles area linked the issue to dependence on foreign oil. "I like the idea of generating electricity," she said, "and I like the idea of not using as much oil from other countries." A Nashville man expressed a similar thought. "Trash is fuel," he said. "We keep importing oil from the Middle East -- I've been in two wars, and we need a reliable [source of fuel to prevent another war]." Some said that even though incinerators do not recycle resources, they reuse resources through the generation of electricity. A woman from the Nashville area said incinerators gave communities a way to turn solid waste into something positive. "We are always after 'them' (scientists,

"I like the idea of generating electricity, and I like the idea of not using as much oil from other countries."
--Los Angeles Woman

"Japan wouldn't have [incinerators] if they were causing cancer and they were dirty and all those things."
--Los Angeles Woman

utility companies, business and industry) to come up with something better," she said. "With the incinerator, they have come up with something positive. It keeps itself going [by using the electricity it generates] plus providing electricity [to sell]. The landfill doesn't."

A third reason why many respondents favored more incinerators was that their communities used them. In three of the four sites, Chicago, Hartford, and Nashville, incinerators had been used for some time. For many respondents then, incinerators were a known quantity that had been used for years without much cause for concern. A man from the Nashville area said, "We have one [the Nashville Thermal Transfer Corporation Plant] that has been in operation for about 20 to 30 years, and they just added onto it. And I have heard of no ill effects from that." Others agreed that their community's experience had not led to problems. A woman from the Los Angeles area said, "I think incinerators are a good idea. I remember the incinerators from 20 years ago [where I used to live]. We burned everything. We had no smog whatsoever, none." As some respondents talked about their community's experience, others learned about or were reminded of that experience and so "familiarity" actually increased as a result of the discussions. Many respondents in Nashville, for example, were impressed to learn that their community had been using incinerators for years without any major problems or reported damage to public health.

Several respondents were also impressed to learn that other countries, including Japan and Sweden, use incinerators, a point made in the film. A woman from the Los Angeles area said, "Japan wouldn't have [incinerators] if they were causing cancer and they were dirty and all those things." A man from the Chicago area said that even if incinerators were somewhat dangerous, they could probably be made safe without too much effort or expense. "I think Japan is way ahead of us on [the safety of] these emissions and the poisonous fumes and ash that comes from these [incinerators]," he said. "I'm pretty sure our scientists will catch up and figure out how to make [incinerators] safe."

In the intervention, respondents learned that source reduction and recycling cannot, by themselves, eliminate the need for landfill or incineration. And so respondents saw that in order to dispose of the remaining trash, they had to choose between what most saw as the two least attractive alternatives, incineration and landfill; for most, incineration was much less objectionable. A recent national study also found that, by a margin of 56 percent to 33 percent, most people preferred incinerators to landfills. (See Table 16.)

Some respondents felt that the potential environmental and public health dangers were greater with landfill. A woman from the Nashville area said, "It's either [build more incinerators] or dump it in our drinking water [because of leachate, the run off or leakage from a landfill that can seep into and contaminate the water supply]." Another woman from that community said, "I think [solid waste] should be burned simply because with a landfill, [leachate will] eventually get into the water underground. [Leachate] is going to go into the river and contaminate the water and cause problems." (Nashville's existing landfill is next to the Cumberland River, the source of the community's drinking water.)

Incinerators were also felt to be less objectionable for aesthetic reasons. A man from the Nashville area said, "I don't think incinerators give off half the odor landfills do. Landfills just absolutely destroy a whole neighborhood for miles around. The odor from it and the trash that falls off the trucks, [make it] a disaster area." In a number of sessions, moderators asked whether respondents would rather live near a landfill or an incinerator. In group after group, with virtual unanimity, panel members said they would rather live near an incinerator.

"I don't think incinerators give off half the odor landfills do. Landfills just absolutely destroy a whole neighborhood for miles around."
--Nashville Man

3. However, most respondents agreed to build new incinerators only if certain conditions were met, two of which concerned public health and safety and involved additional cost.

Large numbers of respondents suggested that their support for building new incinerators was dependent on one or more of the following:

- Incineration should not preclude recycling;
- Incinerators should not be built near residential neighborhoods;
- Clean air standards should not be compromised; and
- Trash should be separated ahead of time so that toxic materials are not burned.

Most respondents favored an integrated solid waste disposal program where only the trash that could not be recycled would be incinerated. In the film one of the arguments in favor of building more incinerators was convenience: incinerator-bound trash would not have to be separated. A handful of respondents even felt that incineration should be the primary means to solve the solid waste problem. A man from the Nashville area said, "It looks to me if incineration takes care of 90 percent of our trash. There is something we can work with." But nearly everyone else wanted to separate and recycle their trash, and therefore the panel did not support incinerators for this reason, convenience was not a factor. A man from Los Angeles expressed the sentiments of many when he said, "I would recommend incineration, but only for part of the trash, not for everything. I say, incineration along with recycling. Recycle what can be used over again, and incinerate the rest." A woman from Chicago said, "Why can't they combine the best of two [options]? Recycle some of [our trash] and burn the rest." A woman from Hartford favored all four options. "Combine them," she said. "Create less garbage, recycle what we can, burn the rest, and then dump [the incinerator ash] in the landfill."

"Combine them. Create less garbage, recycle what we can, burn the rest, and then dump [the incinerator ash] in the landfill."
--Hartford Woman

In both the pretest and the posttest, there was noticeably less support when the trade-off was locating incinerators near residential neighborhoods. Even in the posttest, 32 percent did not want to build more incinerators if they would be located near a residential area and another 12 percent were not sure. In the discussions many suggested that their support was conditional. A woman from the Nashville area said, "Out in the open, away from residential areas [an incinerator] would probably be okay. But I don't want to live near one." A few panel members linked location to health, arguing that an incinerator located in less populated areas would mean that fewer people would be at risk if incinerators were found to be unsafe. A Los Angeles area woman described what happened where she used to live. "Thirty years ago they had an incinerator outside of Springfield, Ohio, and it stunk," she said. A woman from the Hartford area said, "For some things, [incineration] would be okay, but not for other things like styrofoam. When you light styrofoam, it smells. I wouldn't want to live next to something that smells like that." For many respondents then, locating new incinerators away from populated or residential areas was a second condition for building them. (See Table 15.)

> ***"Out in the open, away from residential areas [an incinerator] would probably be okay. But I don't want to live near one."***
> *--Nashville Woman*

The panel was asked to assume that any incinerator under consideration would make use of what we called the "latest, state-of-the-art" technology and air pollution control equipment (including scrubbers, although we tried to avoid using that term or getting into a discussion about particular technology). A number of people made it clear that their support depended on that assumption in spite of any additional costs. A Chicago area man said he was in favor "if these incinerators meet government clean air standards, just like our automobiles have to meet. That's part of the solution." A man from the Los Angeles area suggested that he would favor more incinerators if air pollution control technology were improved, which he felt would not be difficult. "With a little bit of research," he said, "we could devise ways to eliminate some of the [incinerator-generated] odor. And that hopefully would eliminate some of the bad feelings people have about where these should be located." A man from the Nashville area said, "Why can't we, with all our technology, work on improving the exhaust and emissions and trash that's coming out of the incinerator? Do something with that to clean it up." When that happened, he implied, he would favor building more of them. Importantly, literally not one of the 402 respondents suggested that costs be kept down by using less expensive (and presumably less effective) environmental protection equipment.

Finally, a number of respondents said they would support building more incinerators only if the danger were reduced and the process made safer by removing toxic materials before burning. Several proposed that car batteries or styrofoam be separated out, arguing this would reduce dangerous emissions and be worth any additional cost

"Separate out the [solid waste] that's bad for you [if it were incinerated] and burn the rest."
--Chicago Man

and inconvenience. A Nashville area man said, "There are probably a lot of things you can burn quite safely [in an incinerator] but there are some things you ought not to burn -- like styrofoam. So if you could filter out those things that should not be burned, I would be for an incinerator." A man from Hartford made a similar point. "You have to classify your garbage," he said. "This is burnable, this is hazardous, this is disposable, this is recyclable. Because every [bit of] waste that you have is different. I think we should recycle what we can, incinerate what is safe to incinerate, and bury the rest." A man from the Chicago area said, "Separate out the [solid waste] that's bad for you [if it were incinerated] and burn the rest."

4. Even though most panel members said the risks posed by incinerators were acceptable, many remained uncertain, even after the intervention. And a significant minority, many of whom had strong feelings, felt as they did because of their concern about the threat to health, not aesthetics or location.

By a posttest margin of 58 to 22 percent, respondents said the risks of emissions from incinerators were negligible or at an acceptable level. And by a posttest margin of 49 to 28 percent, the group disagreed that incinerators are a danger to public health. However, in both cases, a sizable minority said that incinerators do present an "unacceptable level" of risk (22 percent) or are a "serious threat to public health" (28 percent). And in both cases, large minorities (20 and 23 percent, respectively) were not sure. In addition, although the number who opposed building new incinerators decreased sharply from the pretest, those who remained opposed, nearly one in four, often expressed themselves forcefully. (See Tables 17 and 18.)

Some respondents suggested that a "majority" of experts had been wrong in the past, sometimes with disastrous consequences. "There have been a number of things that on the surface weren't dangerous. What is that drug they gave women -- Thalidomide?," a Nashville area woman asked. "[Incinerators] could be the same thing and we [would] find out the dangers thirty years later." A man from Los Angeles made a similar point. "We've been led down the garden path too many times by so-called scientists. Take nuclear power plant generators. Now we find all kinds of faults with them, but they told us they were very safe and nothing could go wrong with them."

"We've been led down the garden path too many times by so-called scientists. Take nuclear power plant generators. Now we find all kinds of faults with them, but they told us they were very safe and nothing could go wrong with them."
--Los Angeles Man

A number of respondents suggested that in view of the uncertainty among experts, it would simply be prudent to wait until more is learned. A woman from the Nashville area said, "The plastics and things -- we really don't know about the emissions of some of these or how dangerous they are." A woman from the Chicago area said, "There are too many unknowns about what's going to be coming out into the air." Another woman from that area said, "I'd like to be a little more certain about the long term repercussions of incinerators. We could be biting off our nose to spite our face."

Others felt that enough was known already to make incineration an unacceptable option. A man from the Los Angeles area said, "I think it's totally absurd to burn things and ruin the atmosphere with all the toxins and fumes and everything else. I'd rather bury [trash] than burn it." A Chicago area man said, "What about the [emissions] we don't see? What about the carbon dioxide and the stuff that's going to harm the ozone layer? Are we going to build a lot of incinerators to take care of our trash but that are just going to destroy another part of our environment? I don't want to build something that's going to solve one problem but create others." A woman from the Hartford area said, "I think the cons outweigh the pros because you have all this business about the dangerous emissions. I think that totally outweighs the good points in the pro [arguments]."

As noted earlier, familiarity with incinerators often led to greater acceptance. But not everyone who was familiar with them had a positive view. Some who opposed incinerators also spoke from experience. A woman from the Hartford area said, "The ash! I lived in East Hartford and when the wind was blowing right, you'd come out in the morning and say, 'My God, what is this stuff on my car?' It was the ash from the incinerator in Hartford. Now it didn't happen [to me] that often, it depended on how the wind was blowing, but that ash ended up somewhere." A Nashville area woman said, "Have you ever smelled the ash that comes out of an incinerator? It smells awful. It can't possibly be doing the environment any good." A man from that area said, "If you park your car near [an incinerator], you get all kinds of paint damage, all kinds of accumulation."

Finally, it is important to note that we did not ask respondents to consider the cost of building more incinerators (or the cost of any of the other options). Our preliminary research showed that the costs of building a new incinerator varied tremendously depending on where it would be located, the cost of land and labor in each community, the size of the incinerator, the expected revenue generated from selling the electricity, and the expected volume of trash to be burned. In view of all those variables, we thought it wise to omit any discussion of cost. We also omitted discussing the cost of a mandatory recycling program (including the facility, trucks and personnel minus the resale value of the recycled material), or the cost of a new, environmentally-lined, state-of-the-art landfill, or the precise level or effect of various taxes and fees in the area of source reduction.

"Have you ever smelled the ash that comes out of an incinerator? It smells awful. It can't possibly be doing the environment any good."
--Nashville Woman

Incineration: Scientists and the Public

1. Scientists' views about incinerators were strikingly similar to the views of the panel as expressed in the posttest. For example, most of the scientists did not see incinerators as a danger to public health, but a large number were not sure. And while most scientists want to incinerate at least as much solid waste as we do now, they did not see incineration as a preferred option.

On two key questions the scientists' responses paralleled those of the panel as expressed in the posttest. For example, only 12 percent of the 418 scientists surveyed agreed that "because of toxic ash and the possibility of emitting dioxin, burning solid waste in even the most modern solid waste-to-energy incinerators is a serious threat to public health." A narrow majority, 51 percent, disagreed and a large number, 37 percent, were not sure. One scientist wrote, "I agree [that incinerators are a serious threat to public health] but [they] may be better than some alternatives." In response to a similar question,[9] the panel's posttest answers fell into a comparable pattern: while 28 percent agreed that incinerators were too dangerous, 49 percent disagreed, and a large number, 23 percent, were not sure. (See Tables 18 and 19.)

We also asked both groups which of the four solid waste alternatives -- source reduction, recycling, incineration, and landfill -- should be the option of last resort? Just over three in ten scientists (31 percent) named incineration, while 50 percent said landfill. Among panel members in the posttest, 19 percent said incineration was their least favorite choice, while 44 percent named landfill, again a similar pattern of response. (See Tables 25 and 27.)

When asked how much solid waste we should incinerate by the year 2000, 79 percent of the scientists said we should burn at least one-tenth of our waste (about the current level), and 47 percent said we should incinerate at least one-fifth, or more than double what we do now. However, only small percentages called for more incineration than that; for example, only one in five, 19 percent, wanted to incinerate 30 percent or more of our solid waste. According to the Environmental Protection Agency, current national plans are to incinerate about 30 percent of our solid waste by the year 1995, which would triple today's level. But our results suggest that while most of the scientists surveyed definitely want incineration to play a larger role than it currently does, they do not see this as a preferred alternative that should be relied on heavily nor used to the extent now under consideration. (See Table 20.)

Finally, when asked how they thought the public feels about this issue, many of the scientists said they were not sure. A majority of them predicted that "most Americans" do not oppose incinerators, a result consistent with the national panel's views; however, one scientist in five said "most Americans" oppose incinerators and 29 percent were not sure how Americans feel. When asked whether the public has "unrealistic expectations" about incinerator safety, 43 percent agreed that the public does have unrealistic expectations while 28 percent indicated they were not sure if the pubic's expectations were realistic or not. And when asked about the level of public concern about incinerator safety, 33 percent of the scientists said public concern was too high, 10 percent said it was too low, and 32 percent it was about right. (See Tables 21, 22, and 23.)

Landfill

1. When respondents learned more about the solid waste problem and understood that we will always need at least some landfills, support for using them increased. However in the posttest, landfills were the least popular solid waste option.

In the film, the narrator said that no matter how much we make use of the other three solid waste disposal options, "we will still depend on landfills for disposing of at least some of our solid waste." In the discussions, the moderators reiterated that fact and pointed out that incinerator ash will always have to be put into landfills no matter what. Support for using more landfills even if "space is increasingly expensive and hard to find" rose from 38 percent in the pretest to 51 percent in the posttest, a 13 point increase that we interpret as an acknowledgement of the necessity of landfills. A Nashville area man expressed the views of many respondents when he said, "It needs to be understood that we're going to need the landfills. We're always going to need some landfills." (See Table 24 and Chart 4.)

However, when asked to rank the solid waste options in order of preference in the posttest, respondents most often named landfill as their least favorite choice, with 44 percent ranking it last among the four options. Source reduction was the least favorite of 25 percent, a result suggesting the depth of feeling among those who opposed this option. Nineteen percent said incineration was their last preference, and only three percent named recycling. (See Table 25.)

"It needs to be understood that we're going to need the landfills. We're always going to need some landfills."
--Nashville Man

2. Support for building new landfills was qualified, not open-ended.

Most panel members who were willing to build new landfills did not give an open-ended endorsement; rather, they set specific conditions for their support, including the following:

- Landfills should be used with other options;
- Landfills should be built using the latest, state-of-the-art environmental safeguards and regularly monitored for leakage; and
- Landfills should not be located near residential areas.

Most respondents wanted an integrated solid waste disposal system using at least three of the options presented (as noted earlier). That is, nearly everyone who favored new landfills wanted them to be used in combination with other options, especially recycling, but often with source reduction and incineration too. A Los Angeles area man said, "I think we should reduce what we can, recycle the stuff that needs to be recycled, build incinerators close to the landfills, and landfill the ash from the incinerator." A man from the Chicago area said, "There must be a combination of all these things, such as recycling, and banning some highly toxic things, and burning some things, and using landfills. They're all going to have to be used."

Respondents also wanted new landfills to be as safe as possible. The film pointed out that landfills are increasingly expensive because of the rising price of land in many areas and because new landfills must meet new, stricter environmental standards that drive up the cost of construction. In the discussions, the moderators described the option under consideration as "building new landfills using the latest, state-of-the-art methods and applying the strictest environmental standards." Numerous respondents made it clear that their support depended on the proviso that the environment be protected. A woman from the Nashville area said, "If [landfills] aren't going to harm our drinking water, I'd have no problem with them." In each city, respondents wanted landfills to meet the highest environmental standards; quite literally not one panel member of the 402 questioned or expressed concerns about the cost of doing so.

"If [landfills] aren't going to harm our drinking water, I'd have no problem with them."
--Nashville Woman

As described above, when asked whether they would rather live near a landfill or an incinerator, nearly everyone said an incinerator. The group felt that incinerators, though disagreeable, were much less unpleasant. And so, just as with incineration, the panel wanted to build new landfills far away from populated areas. A woman whose mother lives near a landfill said, "On the way to his grandmother's house, my son says, 'Oh, we're almost there, Mom. I can smell the rotten eggs.' It smells so bad that you have to go out and smell the air before you can invite friends over for a barbecue."

"On the way to his grandmother's house, my son says, 'Oh, we're almost there, Mom. I can smell the rotten eggs.' It smells so bad that you have to go out and smell the air before you can invite friends over for a barbecue."
--Hartford Woman

Landfill: Scientists and the Public

1. While the scientists acknowledged that at least some landfills will be needed in the foreseeable future, nearly all of them favored drastically reducing the amount of trash we put into landfills by the year 2000.

When asked which solid waste alternative should be the "option of last resort," 50 percent of the scientists named landfill, making it by far their least popular choice. By way of comparison, 31 percent of the scientists named incinerators, the next most unpopular option. As noted above, the citizen panel also named landfills as the least popular alternative, with 44 percent saying landfills were their least favorite option. (See Tables 25 and 27.)

Most of the scientists felt that landfills would be necessary in the foreseeable future. Only 13 percent said we should landfill less than a tenth of our trash by the turn of the century, while a near majority, 48 percent, said we should landfill at least 20 percent. However, currently about 85 percent of this country's trash is put into landfills.[10] Only one percent of the scientists wanted to landfill that much in the year 2000, and only 14 percent wanted to put even half our trash into landfills at that time -- which in itself would be an enormous reduction. In sum, if the scientists had their way, the country would sharply reduce the amount of solid waste put into landfills, at least halving that amount by the end of the century, and moving from our current near reliance on landfills to using them for only a fraction of our solid waste in the early part of the 21st century. (See Table 28.)

Views of Panel Members in the Four Sites

NASHVILLE

■ Background

While Nashville currently pays only about $9 to $12 per ton to landfill its solid waste, that cost is expected to double within the next few years. In addition, existing landfills are reaching capacity and the metropolitan area government is looking for a new site. In his recent election campaign, Nashville Mayor William Boner promised he would not extend the life of a landfill in the Bordeaux section of the city, yet he would seem to have few alternatives. The state's Department of Health and Environment has imposed a 1990 deadline for the closing of the Bordeaux landfill, thereby giving the metropolitan area government little time to come up with a new site or an alternate plan to dispose of solid waste. But as of the time the panels were conducted, the Mayor and the City Council were unable to agree on a location. Five sites were under consideration, but two bills to allow testing of those sites for suitability were withdrawn after opposition from nearby residents.

Nashville currently incinerates about 30 percent of its solid waste at the Nashville Thermal Transfer Corporation Plant which generates enough power to heat and cool 38 state and city buildings. There has been virtually no controversy about emissions; however, a recent attempt to expand incinerator capacity was opposed by the Metropolitan Board of Health on the grounds that expansion would preclude recycling. The city started a program of voluntary recycling in late 1989, with pilot programs scheduled to begin just after the completion of the panels. In addition, some private groups and churches have set up voluntary recycling centers. However, like the other three sites, Nashville does not have mandatory recycling.

In sum, Nashville has unusually serious solid waste problems for a southern city. While its costs are low compared to other parts of the country, Nashville faces a sharp increase in costs and a lack of short term options. The city cannot expand its incinerator capability until it begins recycling, and only a voluntary, pilot recycling program has been scheduled for the foreseeable future. While landfills are near capacity, the city's Mayor has promised there will be no expansion, yet the government has so far been unable to agree on a new site.

■ In the Panels

Nashville area respondents' reactions to the entire issue were influenced by a controversial plan to construct a new landfill along the Cumberland River, the source of the area's drinking water. Just prior to and during the time the panels were conducted, news coverage about the issue was abundant. Local television stations including WTVF, Channel 5, aired several pieces about the Mayor's and the Metropolitan Government's handling of the plan. There was also television coverage and front page articles in both *The Tennessean* and *The Nashville Banner*, the area's two major newspapers, about a public warning issued by 126 local physicians that the area's drinking water would be contaminated if any of the riverbank sites were selected. The doctors charged that heavy metals could leak out through faults in the seam of the plastic landfill liners and flow into the river, eventually contaminating the city's water supply.

In the discussions, respondents echoed these concerns. One man said that dangerous contaminants "are going to seep down into the water table. Everybody dumps everything in [landfills]." A Nashville area woman said that landfill waste was "going to go in the river and contaminate the water." Even though respondents were told that all new landfills would meet the highest environmental and safety standards, the controversy had convinced a number of Nashville panel members that the risks were too great to accept official assurances. One man said, "I don't want to leave anything in the [local] government's hands to tell me what's safe and not safe."

One result of this controversy was to make landfill less popular in Nashville than in any of the other sites. When asked to rank the four solid waste alternatives, 56 percent of the Nashville respondents named landfills as their least favorite choice. By way of comparison, in Hartford and Chicago, about one in three gave the same response. Further, when asked whether we should build more landfills, Nashville respondents were opposed by a posttest margin of 44 to 38 percent. In each of the other three cities, majorities were in favor of building more landfills in the posttest. (See Tables 25 and 29.)

Support for using incinerators increased sharply in Nashville after the intervention. For example, the number in favor "even if some scientists say they pose a danger to the public" increased by 37 percentage points, from 31 percent in the pretest to 68 percent in the posttest. The number in favor of incinerators even if they had to be located in residential areas more than doubled from 25 percent in favor initially to 54 percent in the posttest. As we noted earlier, many respondents learned in the discussion that Nashville had had an incinerator for years. Additionally, many also learned more about the local controversy with landfills, so that incineration, for many, was more attractive by comparison. (See Tables 30 and 31.)

However, a sizable number of Nashville respondents expressed concern about incinerator safety after the intervention. For example, 25 percent agreed that incinerators pose a "serious threat to public health" and another 26 percent were not sure. When asked a similar question in a different form, 16 percent of the Nashville respondents said that incinerators present a "great deal" of risk and 21 percent were not sure. (See Tables 32 and 33.)

Finally, we should emphasize that Nashville respondents were overwhelmingly in favor of starting an area-wide mandatory curbside recycling program in which residents would have to separate their bottles, cans and newspaper. A majority, 51 percent, wanted to implement such a program immediately and an additional 36 percent said it should be phased in over the next ten years. The results suggest that the area's political leadership has seriously underestimated the willingness of Nashville residents to tackle the solid waste issue through citizen action. (See Table 34.)

HARTFORD

■ Background

The high cost of land and a lack of landfill space have led the city of Hartford to turn almost exclusively to incineration to dispose of its solid waste. The city presently landfills only large objects and incinerator ash. The rest of its trash is incinerated in the Mid-Connecticut trash-to-energy plant located in Hartford that also serves more than 40 other municipalities.

However, controversy has surrounded the $170 million plant from the beginning. *The Hartford Courant* has charged that planners of the project used misleading information to sell the plant to municipal leaders. For example, *The Courant* reports that in 1980, the Connecticut Resources Recovery Authority (CRRA) estimated that the per-ton dumping fee at the facility would be about $10 to $15. But today, less than two years after the project began its commercial operations, costs average about $45 a ton according to *The Courant*. There have also been charges of conflict of interest against government officials and businesses selling trash to the trash authority, and concern about the disposal of incinerator ash that, again according to *The Courant*, was being dumped on top of an unlined landfill located near the Connecticut River. Finally the plant has been closed several times because of boiler explosions.

The old East Hartford landfill has also been a subject of attention. *The Courant* has reported that from 1930 to 1980, toxic contaminants such as industrial solvents and metal sludge were buried in that landfill. As a result, *The Courant* reports that test wells show unusually high levels of chemicals in ground water below the landfill. State environmental officials have not yet determined who is responsible for cleaning up the now closed site.

The state's Department of Environmental Protection recently ruled that as of January, 1991, various forms of trash cannot be accepted by waste disposal companies. As a result, the city of Hartford planned to begin a recycling program by the end of 1989, just after the panels were completed.

■ In the Panel

A few of the Hartford area respondents seemed to be aware of the problems caused by the landfill in East Hartford. For example, one Hartford area man, perhaps in reference to news stories, said, "By choosing landfills, aren't we endangering the environment? Eventually all this stuff will decompose, and the landfill will leak and get into the soil and streams and pollute the water."

But in spite of that controversy, most Hartford area respondents supported building new landfills, with a majority, 53 percent, in favor and 34 percent opposed in the posttest. Only about three in ten, 31 percent, named landfills as their least favorite option compared to a panel-wide posttest average of 44 percent. But at least part of the support for landfills in Hartford may have stemmed from opposition to incineration, a subject of even greater controversy in that community. (See Tables 25 and 29.)

As noted, just prior to the study, *The Hartford Courant* reported various difficulties with the incinerator. Panel members were almost certainly influenced by that controversy and, as a result, there was more opposition to building new incinerators in Hartford than in any of the other cities. In the posttest, Hartford respondents were split with 46 percent in favor of a new incinerator in residential neighborhoods and 44 percent opposed, compared to a panel-wide margin of 56 percent in favor and 32 percent opposed. Also, 29 percent of the Hartford area respondents said incinerators were their least favorite option, a significantly higher number who expressed that view than in Chicago (18 percent), Los Angeles (21 percent), and Nashville (13 percent). Finally, when asked whether incineration presents a "serious threat to public health," only 39 percent of Hartford area residents disagreed, the lowest number in any of the four sites. (See Tables 25, 31 and 32.)

CHICAGO

■ Background

Chicago is the nation's third largest trash producer, generating about 2.5 million tons per year. Since 1987 the city's landfill costs have doubled to $38 per ton, and the city's existing landfills are rapidly filling up. With diminishing landfill space and widespread community opposition to new sites for both landfills and incinerators, the city faces the prospect of even larger cost increases in the next few years.

At present rates, the city's existing landfill space will be exhausted in about four years. But community groups have successfully blocked the construction of new landfills in both the North and South Sides of the city. Private contractors are now looking for new sites in the bordering suburbs and in outlying regions of the city.

Another recent solid waste controversy involved a proposal to build more incinerators. Currently the city operates one waste-to-energy incinerator and would like to build more. But residents of Chicago's affluent North Side have successfully blocked construction of an incinerator in that part of the city; more recently, residents of the South Side and the southern suburbs also voiced strong opposition. Community arguments against a new incinerator include concern about toxic ash and that it will not create jobs for area residents. South Side residents also oppose a new incinerator because they feel they already have more than their fair share of the solid waste burden: the South Side has the largest concentration of landfills in North America.

A recycling pilot program to begin in four wards and expand to all 50 wards by 1993 was scheduled to be considered by the city council in the fall of 1989. But with no established recycling program, strong community opposition to both new landfills and incinerators, and with existing landfills filling up, Chicago faces an impending crisis about how to deal with its unusually large volume of solid waste.

■ In the Panels

In the Chicago area, awareness of solid waste and the issues surrounding landfills was lower than in the other sites. Preliminary research including interviews with two reporters at *The Chicago Tribune* suggests that opposition to new incinerators and landfills was largely community-based, not city- or area-wide. In the panel, support for building new landfills increased more sharply than in any other site, with 62 percent in favor in the posttest, an increase of 22 percentage points. In addition, a comparatively low number of Chicago area respondents (32 percent compared to a panel-wide total of 44 percent) said landfills were their least favorite option. These results could, we feel, be viewed as a measure of what will happen when public understanding of the necessity of landfills is increased absent a situation where the issue has been a subject of significant controversy. (See Tables 25 and 29.)

There was also a marked increase in support for incineration in the Chicago area with 66 percent saying we should build more incinerators even if they must be located near residential neighborhoods. This result represents a 37 point increase from the pretest, the largest increase in any of the sites. When the trade-off was that some scientists say incinerators pose a danger to the public, 75 percent were in favor, a 43 point increase, again the largest in any of the sites. Indeed, the least popular option among Chicago respondents was source reduction, with 39 percent saying it was their last choice, a result suggesting that awareness about the whole solid waste issue may be comparatively low at this time. (See Tables 25, 30, and 31.)

However, as in the other sites, there was very broad and deep support for mandatory recycling with 57 percent in favor of immediately requiring all Chicago area residents to separate and sort their cans, bottles and newspapers, with an additional 30 percent in favor of phasing in such a plan. And so, as in Nashville, it may well be that the area's political leadership has seriously underestimated the willingness of Chicago-area residents to tackle the solid waste issue through action that would inconvenience the citizenry. (See Table 34.)

LOS ANGELES

■ Background

The city of Los Angeles is rapidly approaching a serious garbage crisis. Its one municipal landfill is due to close by 1992 and the city faces mounting disposal costs and diminishing disposal alternatives. Los Angeles landfills two-thirds of its daily output of 6,000 tons of municipal garbage in the Lopez Canyon, and the city is involved in litigation over a State of California plan to close that landfill. New proposals to ship trash by rail to sites in the San Bernardino County desert are under review as are plans to subcontract with currently operating landfill operators in the northern part of Los Angeles County. However, both plans are generating public opposition and the city's current landfill cost of about $15-$20 per ton is expected to rise dramatically within the next few years.

Two years ago the proposed Lancer Project called for the construction of a new incinerator in the south central portion of Los Angeles. However, environmental and citizen groups fiercely opposed the construction of incinerators, with concern focused primarily on the incinerator's contribution to air pollution, not on the dangers of emissions or toxic ash. After much opposition, the project was cancelled. Indeed, opposition was so strong that no new plans for incinerator construction are under consideration at this time.

Los Angeles has a large voluntary recycling program that will involve over 700,000 residences by 1992. The program will provide city residents with special containers to recycle newspapers, glass bottles, aluminum and tin cans, plastic beverage containers, and yard debris. The city has also developed a yard waste composting program as well as a household hazardous waste collection program. These plans are part of the Los Angeles Resource Program which aims to reduce the residential waste going to landfills by 50 percent. However, even with 100 percent compliance, the city will have to look to other alternatives. And with strong public opposition to incinerators and diminishing landfill space, the city will face a solid waste problem into the foreseeable future.

■ In the Panels

In spite of the city's solid waste problem and the controversies noted above, the panel's reactions suggest that the issue has not been a major, area-wide subject of controversy, at least to the extent that it has been in Nashville and Hartford. In the posttest, 56 percent of the Los Angeles area respondents supported building more landfills, a 19 percentage point increase from the pretest and, after Chicago, the largest increase in any site. However, a comparatively high number, 49 percent in the posttest, said landfills were their least favorite option, suggesting that while they recognized a need for landfills, many panel members also had a lower opinion of them than the other options. A number of respondents mentioned the shortage of space in the Los Angeles area and the difficulty of finding new locations. One woman from the area said, "There isn't the land available for landfills. We're having a real problem in Southern California right now." (See Tables 25 and 29.)

The Los Angeles respondents were not overly concerned about incinerator safety compared to people in other sites. Fifty-five percent disagreed that incinerators are a "serious threat to public health," the highest percentage in any city. And 63 percent said that incinerator emissions pose almost "no risk" or risk at "an acceptable level." But while recycling was popular everywhere, it was most popular in the Los Angeles area where 68 percent were in favor of immediately implementing area-wide, mandatory recycling that would require residents to sort their cans, glass bottles and newspapers. An additional 25 percent wanted to phase in mandatory recycling over the next ten years. Further evidence of recycling's popularity in the area is the finding that 39 percent of the Los Angeles respondents wanted to immediately implement an even larger-scale, mandatory recycling program that would require people to sort their trash into five separate containers, while an additional 29 percent wanted to phase in this measure over the next ten years. (See Tables 32, 33, 34, and 35.)

Notes

1 For a more complete description of the process, please see Appendix A.

2 We wanted respondents to consider which alternatives to use in the future. While a number of existing landfills have leaked and leached poisons into the ground water or surrounding surface waters, the experts we interviewed generally agreed that new landfills built using clay, plastic liners, monitoring systems, and other state-of-the-art technology are generally considered safe.

3 For a more complete description of the process, please see Appendix A.

4 The pro and con arguments were developed from 100 open-ended telephone interviews with experts, scientists and government officials, then confirmed by our survey of over 400 leading scientists. (See Appendix E for a list of experts interviewed for the project.)

5 The quotes and qualitative analysis are derived from tape recordings of the sessions.

6 We should emphasize that these estimates were made by the 418 scientists, not by the authors or the Public Agenda Foundation. In addition, we are aware that certain jurisdictions have set much higher goals, that New York State, for example, has adopted a goal of reducing solid waste by 50 percent through recycling and source reduction before the year 2000.

7 We did not differentiate between the amount of solid waste that can be disposed of in incinerators by volume (about 90 percent) as opposed to by weight (about 70 percent); for purposes of clarity, we used the higher figure. Also, respondents were told in the film and again in the discussion that an average-sized incinerator could generate electricity to power itself and up to 10,000 homes per year.

8 The basis for this claim comes from a variety of sources.

First, as part of our background research for the project, we conducted 100 open-ended, expert interviews, visited the newly completed Warren County, New Jersey incinerator, and talked to opponents and proponents of incineration. (A complete list of those interviewed follows in the report.) Those interviews, taken together, suggested that most but not all scientists/experts think that a properly run incinerator is generally safe.

Second, we asked the question in three separate ways in our survey of 418 leading scientists. We asked whether they agreed or disagreed with this statement: "Because of toxic ash and the possibility of emitting dioxin, burning solid waste in even the most modern solid waste-to-energy incinerators is a serious threat to public health -- agree or disagree?" Twelve percent agreed, 51 percent disagreed, and 37 percent were not sure. (See Table 19.)

We also asked if they thought public concern about the safety of solid waste-to-energy incinerators was "too high, too low or about right." Ten percent said public concern was "too low," 33 percent said it was "too high," 32 percent said it was "about right" and 26 percent were not sure. (See Table 23.)

Finally, we asked what percentage of solid waste should be disposed of using incinerators by the year 2000. Only 11 percent said "Less than 10 percent," while 80 percent wanted to incinerate at least 10 percent, and 47 percent wanted to incinerate 20 percent or more. According to the National Solid Wastes Management Association and the EPA, the U.S. incinerates less than 10 percent of its solid waste; and so, in effect, 4 out of 5 of the scientists wanted to incinerate at least as much solid waste as we do now. Even taking into consideration the possibility that many were more worried about landfill safety, we feel that this is an unlikely position to be taken by those who feel that incinerators present a serious threat to public health. (See Table 20.)

Third, a recent EPA survey suggests that if all incinerator projects now under construction in the U.S. are completed on schedule, the country's incineration capacity will increase to nearly 30 percent of the solid waste stream before 1995. It is hard to imagine that incinerator capacity would triple unless most experts felt that a properly run incinerator is not a danger.

Fourth, neither the authors nor the Public Agenda Foundation intend anything in this report to be construed as our own assessment of incinerator safety. Rather, we told the panel members that the information provided was based on what we had learned in our preliminary research, (i.e., how most scientists and solid waste experts feel about this issue).

Fifth and perhaps most important, in the discussions the moderators stressed that the issue was not resolved, that questions remain to be answered, that many scientists and experts sharply disagree, and that a large number simply are not sure about the issue. But, we also said, the people we elect must decide what to do in the face of expert or scientific uncertainty, and that was what we wanted them to do as well.

9 Due to the complexity of the issue, we asked a simplified version of this question to panel respondents. Q:"Burning solid waste even in the most modern waste-to-energy incinerators is a serious threat to public health – agree or disagree?" See Tables 18 and 19 for the complete wording of both questions.

10 Estimates include 80 percent by the Environmental Protection Agency in *The Solid Waste Dilemma: An Agenda for Action*, 1989, and 85 percent by the National Solid Wastes Management Association.

11 Complete question wording is as follows: "How should we deal with solid waste? Indicate what percentage of solid waste should be reduced or disposed of by each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"

12 Complete question wording is as follows: "How should we deal with solid waste? Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"

13 About 10 to 11 percent of the nation's trash currently is recycled. Estimates include 10 percent from the National Solid Wastes Management Association in *Recycling Solid Waste*, 1989, and 11 percent by the Environmental Protection Agency in *The Solid Waste Dilemma: An Agenda For Action*, 1989.

14 Complete question wording is as follows: "How should we deal with solid waste? Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"

15 About 5 to 9 percent of the nation's trash is currently incinerated. Estimates include 5 percent from the National Solid Wastes Management Association and 9 percent from the Environmental Protection Agency in *The Solid Waste Dilemma: An Agenda For Action*, 1989.

16 Complete question wording is as follows: "How should we deal with solid waste? Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"

17 About 80 to 85 percent of the nation's trash is currently put into landfills. Estimates include 80 percent from the Environmental Protection Agency in *The Solid Waste Dilemma: An Agenda For Action*, 1989, and 85 percent from the National Solid Wastes Management Association.

18 We should note that we did not discuss using biodegradable products. There remains a great deal of uncertainty about issues surrounding degradable solid waste. Some scientists and solid waste experts question whether degradable products degrade in a landfill, and some are concerned about the safety of the residues that might be left in the environment by disintegrating plastic. Finally, some experts fear that degradable products might frustrate the recycling of plastic by making plastic unfit for recycling.

19 Please see note 7.

20 Please see Appendix B.

21 For a complete listing of states in each region, please see the map on page 100.

TABLE 1
Views About a Proposal Involving Source Reduction (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require manufacturers to reduce the amount of packaging they use even if that would mean creating a new bureaucracy to enforce the law"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	13	43	33	72	+29
Phase in	30		39		
Don't do	29		20		
Not sure	28		8		

TABLE 2
Views About Banning or Taxing Certain Products
(Comparison of Pretest, Posttest and the Scientists)

"Indicate whether we should ban or tax the following disposable products to discourage people from buying them:"

	Pretest	Posttest	Scientists
	%	%	%
"Styrofoam cups, containers, etc."			
Ban	39	45	39
Tax	25	21	36
Ban or tax	64	66	75
"Disposable diapers"			
Ban	26	28	23
Tax	26	25	40
Ban or tax	52	53	63
"Plastic bags"			
Ban	24	31	18
Tax	23	22	45
Ban or tax	47	53	63
"Disposable plastic products (pens, razors, etc.)"			
Ban	13	24	13
Tax	33	31	46
Ban or tax	46	55	59
"Paper products, napkins and cups"			
Ban	5	10	2
Tax	23	27	28
Ban or tax	28	37	30

TABLE 3
Views About Banning or Taxing Disposable Diapers (Comparison of Persons Under 40 Years and 65 Years or Older and of Men and Women, Posttest)

"Indicate whether we should ban or tax the following disposable products to discourage people from buying them:"

	Under 40 Years	65 Years Or Older	Men	Women
	%	%	%	%
"Disposable diapers"				
Ban or tax	42	68	54	53
Neither	54	22	39	37
Not sure	4	10	7	11

TABLE 4
Views About Banning or Taxing Certain Products
(Comparison of Pretest, Posttest and Scientists)

"Indicate whether we should ban or tax the following disposable products to discourage people from buying them:"

	Pretest	Posttest	Scientists
	%	%	%
"Styrofoam cups, containers, etc."			
Ban	39	45	39
Tax	25	21	36
Neither	23	27	15
Not sure	13	7	9
"Disposable diapers"			
Ban	26	28	23
Tax	26	25	40
Neither	36	38	24
Not sure	12	9	13
"Plastic bags"			
Ban	24	31	18
Tax	23	22	45
Neither	38	37	26
Not sure	15	10	11
"Disposable plastic products (pens, razors, etc.)"			
Ban	13	24	13
Tax	33	31	46
Neither	34	33	27
Not sure	21	12	14
"Paper products, napkins and cups"			
Ban	5	10	2
Tax	23	27	28
Neither	57	51	63
Not sure	15	11	8

TABLE 5
Solid Waste Disposal in the Year 2000: Source Reduction (Scientists)

Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000.[11]

"Source Reduction"

Percent of Solid Waste to be Disposed of Using Source Reduction by the year 2000

	Scientists	20 Percent or More	10 Percent or More
	%	%	%
Less than ten percent	7		
Ten to nineteen	18		82
Twenty to twenty-nine	29	64	
Thirty to thirty-nine	16		
Forty to forty-nine	9		
Fifty percent or more	10		
Not sure/no answer	10		

Mean = 25 percent.
Median = 20 percent.

TABLE 6
Views About a Proposal Involving Source Reduction
(Comparison of Posttest and Scientists)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require manufacturers to reduce the amount of packaging they use even if that would mean creating a new bureaucracy to enforce the law"

	Scientists	Scientists Total	Posttest	Posttest Total	Difference
	%	%	%	%	
Do now	19	51	33	72	+21
Phase in	32		39		
Don't do	39		20		
Not sure	11		8		

TABLE 7
Views About Proposals Involving Recycling
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require everyone to separate garbage into three parts (newspapers, bottles and cans, and everything else) for recycling even if that would be inconvenient"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	59	89	60	90	+1
Phase in	30		30		
Don't do	8		6		
Not sure	3		4		
"Impose a five cent deposit on all bottles and cans to encourage recycling even if that increases the cost of soda, beer, etc."					
Do now	59	85	61	84	-1
Phase in	26		23		
Don't do	11		12		
Not sure	5		5		
"Require people to take potentially hazardous materials such as used batteries and old cans of paint to centrally located drop-off centers even if that would be very inconvenient"					
Do now	58	86	60	84	-2
Phase in	28		24		
Don't do	8		12		
Not sure	7		5		

TABLE 8
Views about Recycling
(Los Angeles Times, 1989)

"In order to improve the environment, are you prepared to make personal sacrifices, or not?...Are you willing or not to separate your trash into papers and bottles and aluminum cans to aid in waste disposal?"

Are you willing to separate your trash?

	Los Angeles Times, 1989
	%
Willing	93
Unwilling	6
Not sure	1

Source: Los Angeles Times, November 1989, National Sample = 1623

TABLE 9
Views About Recycling into Five Containers
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require everyone to separate garbage into five parts (newspapers, bottles and cans, plastics, compostable yard and food waste, and everything else) for recycling even if that would be very inconvenient"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	31	63	30	64	+1
Phase in	32		34		
Don't do	26		28		
Not sure	11		8		

TABLE 10
Views About Proposals Involving Recycling
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require publishing companies to use recycled paper even if that would increase the cost of newspapers and magazines"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	38	80	44	85	+5
Phase in	42		41		
Don't do	11		7		
Not sure	10		8		
"Give tax breaks to businesses that use recycled paper, plastic, etc., even if that means major corporations would get most of the benefit"					
Do now	29	65	31	66	+1
Phase in	36		35		
Don't do	23		25		
Not sure	12		9		
"Require companies to recycle paper and cardboard even if businesses that rely on certain packaging would close and workers would lose their jobs"					
Do now	12	56	26	74	+18
Phase in	44		48		
Don't do	27		15		
Not sure	18		11		

TABLE 11
Views About Recyclable Packaging
(Comparison of Pretest and Posttest)

"If you knew a certain food or beverage container could not be recycled, would you:"

	Pretest	Posttest	Change
	%	%	
Continue buying it as normal	27	20	
Buy a comparable product in a recyclable container	47	64	+17
Not sure	26	17	

TABLE 12
Views About a Fee on Nonrecyclable Packaging
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Impose a fee on all nonrecyclable packaging even if this would mean a price rise for many products and a slight increase in inflation"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	15	65	21	69	+4
Phase in	50		48		
Don't do	17		22		
Not sure	17		9		

TABLE 13
Views on Proposals Involving Recycling (Scientists)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

	Do Now	Phase In	Don't Do	Not Sure
	%	%	%	%
"Impose a five cent deposit on all bottles and cans to encourage recycling even if that increases the cost of soda, beer, etc."	70	18	7	5
"Require everyone to separate garbage into three parts (newspapers, bottles and cans, and everything else) for recycling even if that would be inconvenient"	60	32	6	3
"Require people to take potentially hazardous materials such as used batteries and old cans of paint to centrally located drop-off centers even if that would be very inconvenient"	53	32	11	5
"Give tax breaks to businesses that use recycled paper, plastic, etc., even if that means major corporations would get most of the benefit"	38	40	16	6
"Impose a fee on all nonrecyclable packaging even if this would mean a price rise for many products and a slight increase in inflation"	37	45	13	5
"Require publishing companies to use recycled paper even if that would increase the cost of newspapers and magazines"	31	44	16	8
"Require everyone to take used appliances, toys and clothing to centrally located drop-off centers even if that would be very inconvenient"	24	34	30	12
"Require everyone to separate garbage into five parts (newspapers, bottles and cans, plastics, compostable yard and food waste, and everything else) for recycling even if that would be very inconvenient"	23	33	33	12
"Require companies to recycle paper and cardboard even if businesses that rely on certain packaging would close and workers would lose their jobs"	19	55	18	9

TABLE 14
Solid Waste Disposal in the Year 2000: Recycling (Scientists)

Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000.[12]

"Recycling"[13]

Percent of Solid Waste to be Disposed of Using Recycling by the year 2000:

	Scientists	Twenty Percent or More
	%	%
Less than ten percent	1	
Ten to nineteen	9	
Twenty to twenty-nine	29	79
Thirty to thirty-nine	20	
Forty to forty-nine	14	
Fifty percent or more	16	
Not sure/No answer	10	

Mean = 32 percent.
Median = 30 percent.

TABLE 15
Views About Incineration
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build more incinerators that turn solid waste into electricity even if some scientists say they pose a danger to the public"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	14	36	31	70	+34
Phase in	22		39		
Don't do	33		19		
Not sure	31		11		

"Build more incinerators that turn solid waste into electricity even if that means locating them near residential neighborhoods"

Do now	7	30	18	56	+26
Phase in	23		38		
Don't do	50		32		
Not sure	20		12		

TABLE 16
Views about Incineration and Landfill
(Associated Press, 1987)

"Some communities use landfills or dumps for disposal of community trash. Other communities use incinerators to burn the trash. If you had a choice, which method would you prefer your community to use?"

Which method do you prefer?	Associated Press, 1987
	%
Landfills/dumps	33
Incinerators	56
Don't know/No answer	11

Source: Associated Press, April 1987, National Sample = 1304

TABLE 17
Views About Safety and Risk
(Posttest)

"When it comes to the safety of each of the following, would you say there is:
- Almost no risk or danger;
- Some risk or danger, but at an acceptable level;
- A great deal of risk or danger at an unacceptable level?"

	Posttest	Almost no risk/ An acceptable level
	%	%
"Vaccines for diseases like whooping cough"		
Almost no risk	43	77
Acceptable level	34	
Unacceptable level of risk	7	
Not sure	17	
"The purity of ordinary drinking water"		
Almost no risk	16	68
Acceptable level	52	
Unacceptable level of risk	20	
Not sure	12	
"The safety of the blood supply"		
Almost no risk	13	63
Acceptable level	50	
Unacceptable level of risk	20	
Not sure	17	
"The safety of birth control pills"		
Almost no risk	11	62
Acceptable level	51	
Unacceptable level of risk	17	
Not sure	21	
"Emissions from solid waste incinerators"		
Almost no risk	11	58
Acceptable level	47	
Unacceptable level of risk	22	
Not sure	20	
"Nuclear power plants"		
Almost no risk	12	51
Acceptable level	39	
Unacceptable level of risk	36	
Not sure	14	

Table 17 (continued)
(Posttest)

	Posttest	Almost no risk/ An acceptable level
	%	%
"The safety of hazardous waste sites after the government cleans them up"		
Almost no risk	6	48
Acceptable level	42	
Unacceptable level of risk	32	
Not sure	20	
"The use of pesticides in agriculture"		
Almost no risk	4	38
Acceptable level	34	
Unacceptable level of risk	48	
Not sure	14	

TABLE 18
Views About Incineration and Public Health (Posttest)

"Indicate whether you agree or disagree with the statements below:"

"Burning solid waste in even the most modern waste-to-energy incinerators is a serious threat to public health"

	Posttest
	%
Agree	28
Disagree	49
Not sure	23

TABLE 19
Views About the Safety of Incineration (Scientists)

"Indicate whether you agree or disagree with the statements below:"

"Because of toxic ash and the possibility of emitting dioxin, burning solid waste in even the most modern solid waste-to-energy incinerators is a serious threat to public health."

	Scientists
	%
Agree	12
Disagree	51
Not sure	37

TABLE 20
Solid Waste Disposal in the Year 2000: Incineration (Scientists)

Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000.[14]

"Incineration"[15]

Percent of Solid Waste to be Disposed of Using Incineration by the year 2000

	Scientists	Twenty Percent or More
	%	%
Less than ten percent	11	
Ten to nineteen	32	
Twenty to twenty-nine	29	47
Thirty to thirty-nine	9	
Forty to forty-nine	5	
Fifty percent or more	5	
Not sure/No answer	10	

Mean = 20 percent.
Median = 20 percent.

TABLE 21
Views About Public Opinion Towards Building Incinerators (Scientists)

"Which, if any, of these ideas do you think most Americans oppose today?"

"Building many more waste-to-energy incinerators equipped with modern air pollution equipment (scrubbers)"

Most Americans Oppose Building More Incinerators:

	Scientists
	%
Agree	20
Disagree	51
Not sure	29

TABLE 22
Views About The Public and Zero Risk (Scientists)

"Some scientists and other experts complain that the public has unrealistic expectations about risk, that people want a risk-free or 'zero risk' environment when there is no such thing. Are the public's expectations unrealistic when it comes to:"

"Emissions from solid waste incinerators"

Public Expectations About the Risk of Emissions From Solid Waste Incinerators Are:

	Scientists
	%
Unrealistic	43
Not unrealistic	29
Not sure	28

TABLE 23
Views of Public Concern About the Safety of Incinerators
(Scientists)

"EPA Director William Reilly recently said Americans are 'too concerned' about some threats to the environment and public health, and 'not concerned enough' about others. For each threat below, indicate whether you think the level of public concern is too high, too low, or about right:"

"The safety of solid waste-to-energy incinerators"

The level of public concern about incinerators is:

	Scientists
	%
Too high	33
About right	32
Too low	10
Not sure	26

TABLE 24
Views About Landfill
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build and use more landfills even if new landfill space is increasingly expensive and hard to find"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do now	10	38	20	51	+13
Phase in	28		31		
Don't do	39		37		
Not sure	23		13		

TABLE 25
Least Favorite Option for Solid Waste Disposal
(Comparison of the Four Locations, Posttest)

"When dealing with solid waste, rank each option in your order of preference. (Give a 1 to your first or favorite choice, a 2 to your second choice, a 3 to your third choice, and a 4 to your last or least favorite choice)"

Least Favorite Option	Total	Nashville	Los Angeles	Chicago	Hartford
	%	%	%	%	%
Landfill	44	56	49	32	31
Source Reduction	25	18	19	39	25
Incineration	19	13	21	18	29
Recycling	3	3	4	3	3

TABLE 26
Most Favorite Option for Solid Waste Disposal
(Comparison of the Four Locations, Posttest)

"When dealing with solid waste, rank each option in your order of preference. (Give a 1 to your first or favorite choice, a 2 to your second choice, a 3 to your third choice, and a 4 to your last or least favorite choice)"

Most Favorite Option	Total	Nashville	Los Angeles	Chicago	Hartford
	%	%	%	%	%
Recycling	49	47	56	53	41
Source Reduction	20	17	24	15	27
Incineration	20	23	16	19	19
Landfill	2	2	1	2	3

TABLE 27
Solid Waste Option of Last Resort (Scientists)

"When dealing with solid waste, what should be the option of last resort?"

	Scientists
	%
Landfills	50
Incineration	31
Source reduction	4
Recycling	1
Not sure	14

TABLE 28
Solid Waste Disposal in the Year 2000: Landfill (Scientists)

"Indicate what percentage of solid waste should be reduced or disposed of using each method below by the year 2000. (Currently about 85% of our solid waste goes into landfills.)"[16]

"Landfills"[17]

Percent of Solid Waste to be Disposed of Using Landfill by the year 2000

	Scientists	20 Percent or More	Less Than Fifty Percent
	%	%	%
Less than ten percent	13		76
Ten to nineteen	29		
Twenty to twenty-nine	20	48	
Thirty to thirty-nine	6		
Forty to forty-nine	8		
Fifty percent or more	14		
Not sure/No answer	10		

Mean = 23 percent.
Median = 20 percent.

TABLE 29
Views About Landfill
(The Four Locations, Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build and use more landfills even if new landfill space is increasingly expensive and hard to find"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Total Panel					
Do now	10	38	20	51	+13
Phase in	28		31		
Don't do	39		37		
Nashville					
Do now	8	30	16	38	+8
Phase in	22		22		
Don't do	43		44		
Los Angeles					
Do now	10	37	24	56	+19
Phase in	27		32		
Don't do	41		35		
Chicago					
Do now	14	40	22	62	+22
Phase in	26		40		
Don't do	40		31		
Hartford					
Do now	9	48	18	53	+5
Phase in	39		35		
Don't do	30		34		

TABLE 30
Views About Incineration and Safety
(The Four Locations, Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build more incinerators that turn solid waste into electricity even if some scientists say they pose a danger to the public"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Total Panel					
Do now	14	36	31	70	+34
Phase in	22		39		
Don't do	33		19		
Nashville					
Do now	12	31	30	68	+37
Phase in	19		38		
Don't do	39		19		
Los Angeles					
Do now	16	41	27	72	+31
Phase in	25		45		
Don't do	24		19		
Chicago					
Do now	11	32	33	75	+43
Phase in	21		42		
Don't do	31		15		
Hartford					
Do now	19	44	33	65	+21
Phase in	25		32		
Don't do	33		26		

TABLE 31

Views About Incineration and Their Location

(The Four Locations, Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Build more incinerators that turn solid waste into electricity even if that means locating them near residential neighborhoods"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Total Panel					
Do now	7	30	18	56	+26
Phase in	23		38		
Don't do	50		32		
Nashville					
Do now	6	25	21	54	+29
Phase in	19		33		
Don't do	54		33		
Los Angeles					
Do now	7	36	17	58	+22
Phase in	29		41		
Don't do	39		27		
Chicago					
Do now	6	29	19	66	+37
Phase in	23		47		
Don't do	53		26		
Hartford					
Do now	10	32	13	46	+14
Phase in	22		33		
Don't do	52		44		

TABLE 32
Views About Incineration and Public Health (The Four Locations, Posttest)

"Indicate whether you agree or disagree with the statements below:"

"Burning solid waste in even the most modern waste-to-energy incinerator is a serious threat to public health"

Burning waste in incinerators is a public health threat:

		Posttest
		%
Total Panel		
	Agree	28
	Disagree	49
	Not sure	23
Nashville		
	Agree	25
	Disagree	49
	Not sure	26
Los Angeles		
	Agree	25
	Disagree	55
	Not sure	20
Chicago		
	Agree	29
	Disagree	52
	Not sure	19
Hartford		
	Agree	33
	Disagree	39
	Not sure	28

TABLE 33
Views About the Safety of Incineration
(The Four Locations, Posttest)

"When it comes to the safety of each of the following, would you say there is:

- Almost no risk or danger;
- Some risk or danger, but an acceptable level;
- A great deal of risk or danger at an unacceptable level?"

"Emissions from solid waste incinerators"

	Posttest	Almost no risk/ An acceptable level
	%	%
Total Panel		
Almost no risk	11	58
Acceptable level	47	
Unacceptable level of risk	22	
Not sure	20	
Nashville		
Almost no risk	13	63
Acceptable level	50	
Unacceptable level of risk	16	
Not sure	21	
Los Angeles		
Almost no risk	14	63
Acceptable level	49	
Unacceptable level of risk	22	
Not sure	16	
Chicago		
Almost no risk	8	54
Acceptable level	46	
Unacceptable level of risk	25	
Not sure	21	
Hartford		
Almost no risk	7	51
Acceptable level	44	
Unacceptable level of risk	28	
Not sure	21	

TABLE 34
Views About Recycling into Three Containers (The Four Locations, Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require everyone to separate garbage into three parts (newspapers, bottles and cans, and everything else) for recycling even if that would be inconvenient"

		Pretest	Pretest Total	Posttest	Posttest Total	Change
		%	%	%	%	
Total						
	Do now	59	89	60	90	+1
	Phase in	30		30		
	Don't do	8		6		
	Not sure	3		4		
Nashville						
	Do now	49	88	51	87	-1
	Phase in	39		36		
	Don't do	9		7		
	Not sure	4		6		
Los Angeles						
	Do now	66	89	68	93	+4
	Phase in	23		25		
	Don't do	10		4		
	Not sure	1		3		
Chicago						
	Do now	59	88	57	87	-1
	Phase in	29		30		
	Don't do	8		9		
	Not sure	4		4		
Hartford						
	Do now	67	90	70	96	+6
	Phase in	23		26		
	Don't do	6		5		
	Not sure	4		–		

TABLE 35
Views About Recycling into Five Containers
(The Four Locations, Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

"Require everyone to separate garbage into five parts (newspapers, bottles and cans, plastics, compostable yard and food waste, and everything else) for recycling even if that would be very inconvenient"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Total Panel					
Do now	31	63	30	64	+1
Phase in	32		34		
Don't do	26		28		
Not sure	11		8		
Nashville					
Do now	24	59	22	58	-1
Phase in	35		36		
Don't do	28		31		
Not sure	13		[illegible]		
Los Angeles					
Do now	42	70	39	68	-2
Phase in	28		29		
Don't do	26		25		
Not sure	4		7		
Chicago					
Do now	35	63	33	64	+1
Phase in	28		31		
Don't do	20		27		
Not sure	17		9		
Hartford					
Do now	28	62	26	66	+4
Phase in	34		40		
Don't do	29		29		
Not sure	9		4		

TABLE 36
Summary of Proposals Involving Solid Waste (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

Proposal	Pretest	Posttest	Change
	%	%	
Recycle into three containers	89	90	+1
Require people to take hazardous waste to a centrally located drop-off center	86	84	-2
Place a five cent deposit on bottles and cans	85	[illegible]	-1
Require publishing companies to use recycled paper	80	85	+5
Place a fee on all nonrecyclable packaging	65	69	+4
Give tax incentives to business who use recycled paper	65	66	+1
Recycle into five containers	63	64	+1
Require companies to recycle	56	74	+18
Require manufacturers to reduce packaging	43	72	+29
Build more landfills	38	51	+13
Build more incinerators, concern about safety	36	70	+34
Build more incinerators near residential areas	30	56	+26

TABLE 37
Summary of Proposals Involving Recycling (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with solid waste, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Don't do it, no matter what"

Proposal	Scientists	Posttest	Difference
	%	%	
Recycle into three containers	92	90	-2
Place a five cent deposit on bottles and cans	88	84	-4
Require people to take hazardous waste to a centrally located drop-off center	85	84	-1
Place a fee on all nonrecyclable packaging	82	69	-13
Give tax incentives to businesses using recycled paper	78	66	-12
Require publishing companies to use recycled paper	75	85	+10
Require companies to recycle	74	74	nd
Recycle into five containers	56	64	+8
Require manufacturers to reduce packaging	51	72	+21

Appendix A:

The Solid Waste Intervention

The first half of the film and the discussion focussed on solid waste. The film described what solid waste is and explained why its disposal is becoming a local problem.

> Solid waste is garbage, the things that each day everyone of us throws away. It is food and plastic packaging, paper and cardboard, bottles and cans, grass clippings and leaves from our backyards, and things like old tires and refrigerators. Solid waste isn't human waste, or sewage, it isn't the toxic chemical waste produced by industry, and it isn't radioactive waste from nuclear reactors. It's just trash. And the issue is just what should we do with the ever increasing amounts of garbage we are producing in this country.
>
> How do we normally dispose of it? Well, traditionally we have put solid waste in what are called landfills. Landfills are basically holes in the ground into which we throw unprocessed garbage. When they are full, they are covered over with clay, dirt and sod. Landfills have generally been a relatively inexpensive, safe, and convenient way to dispose of garbage and even today remain the most common way of dealing with solid waste. We still landfill about 80 percent of our solid waste.
>
> So what is the problem? Well first, we are churning out more and more garbage every year, and as we do, existing landfills are filling up. Meanwhile landfilling garbage is getting more and more expensive because: a) land in many places is getting more expensive, b) in some places there is no room for new landfills so we are shipping garbage out of state which is also very expensive, and c) new landfills which meet new, stricter safety standards, cost more to construct.

Respondents were asked to consider four ways to dispose of solid waste: source reduction, recycling, incineration, and landfill. For each option, the film discussed arguments for and against each specific method.

The film first discussed a proposal to create less trash by requiring manufacturers to reduce packaging, and banning or taxing disposable products such as pens and razors, napkins and cups, styrofoam cups and containers, etc.

The pro arguments included the fact that source reduction reduces garbage, conserves natural resources, and reduces the cost of disposing of excess trash. Arguments against this option were that it would be very inconvenient, it might lead to layoffs for companies that make disposable products, and these requirements would be hard to enforce.[18]

The second set of solutions addressed mandatory recycling. Proposals ranged from a three-category curbside pick-up, to a five cent deposit on bottles and cans, to a requirement for publishing companies to use recycled paper. The film then pointed out the arguments in favor and against recycling. Respondents were told that advocates say it conserves natural resources, poses little threat to the environment, and would create jobs, especially for unskilled workers. On the other hand, the film pointed out, those opposed to mandatory recycling say it is very inconvenient, perhaps impossible for the elderly and handicapped, and would be hard to enforce, especially in big cities. We did not discuss the overall cost of recycling programs since this would vary by region and community because of administration and labor costs, the availability of markets for recycled goods, as well as the amount of recycled goods collected.

Respondents were then told that creating less trash and recycling would not solve our solid waste problem; we cannot reduce and recycle all of our waste. Respondents were asked to consider a third alternative, incineration. The film reviewed the two principal points of view about incinerators. Following the format used for each of the solid waste options, the film briefly described what a waste-to-energy incinerator is, then outlined the main arguments voiced by those in favor of and opposed to building more incinerators. Those in favor, the film said, argue that more incinerators should be built for three reasons: they are capable of burning up to 90 percent of our trash, thereby greatly decreasing our dependence on landfill; they are very convenient as they do not require people to sort their trash; and as they burn the trash, they generate electricity that can be sold to neighboring communities. (See page 89) Respondents were told in the film and again in the discussion that an average size incinerator could generate enough electricity for up to 10,000 homes per year, thereby reducing our dependency on foreign oil.

The film then presented arguments voiced by those who oppose building more incinerators. Opponents' first concern, the film said, is that even with tall smokestacks and the most modern air pollution equipment, incinerators will be difficult to locate because no one wants to live near one. The narrator then said:

> "A second objection is voiced mainly by a small number of scientists, and it involves the safety of incinerators. While most scientists feel that a properly run incinerator is pretty safe, other scientists argue that incinerators are dangerous, too dangerous for us to build and rely on. First, these scientists say, even the newest, most modern incinerators can give off dangerous, cancer-causing emissions if the temperature is not kept hot enough. Second, they argue that the ash left after burning the trash often contains toxic chemicals and that this ash is hard to dispose of safely."

During the discussion, the moderators reviewed these arguments, pointing out the similarity between the way scientists feel about incinerators and the disagreement among doctors about the safety of eating large quantities of red meat or sugar. In each case, the moderators said, experts can be divided into three groups; a comparatively small number who foresee serious trouble if we rely on incinerators (or if people eat a lot of red meat or sugar); a majority who hold a more moderate view, that does not believe incinerators (or red meat or sugar) present much danger, if any; and a third group, what the moderators called "a fair number" of scientists or doctors, who simply are not sure which view is correct.[18] The moderators said that, as with other threats to health, experts will probably reach consensus in a few years about what is safe and what is unsafe, that in the meantime our elected officials had to decide what to do in the face of this uncertainty.

And that is what we wanted them to do -- decide whether or not to build more incinerators in view of the uncertainty among scientists.

Respondents were then reminded that no matter how much we rely on these three alternatives, we must still use landfills for at least some of our trash disposal. Since most of our garbage is currently landfilled, respondents were asked if we should just continue to pay the rising costs of landfilling our garbage. The film explained that some experts support landfills because we have used them for years, we know how safe they are and how to make them safe. Second, landfills are very convenient. Third, landfills are a necessity; no matter what, we will always need landfills. The film then told respondents that some people did not support landfills because they are very expensive in some places, they do not reuse resources, and we are running out of space to locate them.

After the film, respondents divided into groups of approximately fifteen people for a thirty minute discussion led by a moderator from the Public Agenda Foundation. Together they reviewed the material presented in the film and considered the four approaches to addressing the solid waste problem. Three advantages and three disadvantages of each option were discussed,[20] and citizens were asked to think of themselves as members of a citizen advisory committee making recommendations to the President, the Congress, the governor and mayor. After discussing how each alternative would work, respondents were told that in the final, posttest questionnaire, they would be asked again to decide whether and to what degree they would recommend the various options.

Appendix B:
Discussion Guide

OPTION 1: Create Less Trash:

1. Require manufacturers to reduce packaging
2. Ban or tax disposable products such as:
   - Plastic bags and disposable plastic products (pens, razors, etc.)
   - Paper napkins and cups, etc.
   - Styrofoam cups, containers, etc.

PROS

1. Reduces garbage
2. Conserves natural resources (if we use less paper, we cut down fewer trees)
3. Saves money spent on disposing of excess trash

CONS

1. Inconvenient
2. Might harm companies that make disposable products and lead to layoffs
3. Requirements would be hard to enforce

OPTION 2: Mandatory Recycling:

1. Newspaper
2. All other paper
3. Cans and glass
4. Plastics
5. Food and yard waste, including leaves and grass
6. Everything else

PROS

1. Conserves natural resources
2. Safe
3. Creates jobs, especially for the unskilled

CONS

1. Very inconvenient
2. Impossible for the elderly and the handicapped
3. Hard to enforce, especially in big cities

OPTION 3: Incineration:

An incinerator is a giant furnace that burns trash at a very high heat. It can burn almost everything including glass and metals.

PROS

1. Could burn up to 90% of all trash
2. Very convenient
3. Generates electricity that we can sell

CONS

1. Difficult to locate, nobody wants to live near one
2. Scientists don't agree how dangerous emissions are
3. Scientists don't agree how dangerous the ash is

OPTION 4: Landfill:

Landfills are trash dumps. Almost all of our trash now goes into landfills.

PROS

1. We have used landfills for years
2. Very convenient
3. They are a necessitv. No matter what, we will always need landfills

CONS

1. Very expensive in some places
2. Do not reuse resources
3. We are running out of space to locate them

Appendix C:
Methodology

The National Panel: To interview a representative cross section of the noninstitutionalized, voting age population of the United States, we drew a sample using quotas reflecting both regional and, when aggregated, the national population. The sample was designed using data in the *1986 State and Metropolitan Area Data Book* and the *1987 Statistical Abstract of the United States*, published by the U.S. Bureau of Census, and from three national surveys of over 1,000 people conducted by *Americans Talk Security*, a series of national, public opinion telephone surveys conducted by three prominent public opinion firms -- DYG Inc., Market Opinion Research, and Marttila and Kiley - in association with the Public Agenda Foundation. The methodology involved bringing together groups of about fifty people per night for sessions lasting just over three hours. A number of steps, detailed below, were involved in designing the panel.

First, our base for the national panel was designed to be 400 respondents, a large enough sample to provide statistical stability, and to permit regional and subgroup analysis.

Second, for administrative reasons, we conducted the panels in a total of four sites. Using standard Census Bureau divisions, we divided the United States into four principal regions: the Northeast, Midwest, South, and West[21], and drew a sample proportionate to each region's share of the national population. That is, since 22 percent of the nation's population lives in the Northeast, the sample was designed so that about 22 percent of our sample would come from the site chosen to represent that region. (See Table 38.)

Third, since there was no significant regional variation on the basis of sex, our sample quota was 50 percent male and 50 percent female.

Fourth, since there was also no significant regional variation in terms of the average (or mean) age of the population, we collected data about this variable using three national surveys and compiled a three-survey average. This average then became part of the recruiting specifications for each site. That is, in the U.S. as a whole, 23 percent of the noninstitutionalized voting age population is between the ages

of 18 and 29. Therefore, in each of our four sites, 23 percent of the respondents were to be between 18 and 29 years of age. (See Table 39.)

Fifth, we identified three key demographic indicators for which there was significant regional variation and which could also be used as recruiting specifications: race, education and median family income. We then compiled data about each region's demography in terms of those variables.

Sixth, we identified a particular site to represent each of the four regions. Since each site was, in effect, a proxy for the region as a whole, it had to meet a variety of criteria:

a) Each site had to reflect the region's demographic makeup using three key indicators: race, education and median family income. After compiling the regional data, we compared it to the demography of a list of candidate sites within each region and looked for the best match. The demography of the adult population in each site's metropolitan statistical area (MSA) had to approximately reflect the region as a whole. For example, Hartford was the site chosen to represent the Northeast. In the Northeast region of the U.S., 10 percent of the population is black/African-American compared to 7 percent in the Hartford MSA. In terms of education, 33 percent of the people in the Northeast population have less than 12 years of school compared to 30 percent of the people in greater Hartford. According to the Census Bureau, the 1985 median family income for the Northeast was $20,651 in 1986 and $23,372 for Hartford. (See Table 40.)

b) Each site had to represent the region's central social, demographic, cultural and historical character. In each case, we wanted a site that did not have either a unique ethnic mix or history, or an atypical industrial base compared to the region as a whole. Thus, for example, Providence was rejected because it has a large Portuguese population. New Haven was rejected because it is so influenced by the presence of Yale University. New Orleans was rejected because of its history, atypical ethnic makeup and dependence on tourism.

c) Each topic was taken into consideration. Since solid waste is a local problem, we wanted sites that had at least some controversy with this issue; otherwise, respondents might have found questions about the issue meaningless. A large number of southern cities that otherwise might have been a good match for the region as a whole (such as Birmingham, for example) did not have much of a solid waste problem. Landfill costs are low and space for new landfills is comparatively abundant in many parts of the south. However, in Nashville solid waste disposal has been a major issue.

d) Our other topic, the greenhouse effect, is a national/global issue, not a local one. However, since so many of the proposals to reduce emissions contributing to the buildup of greenhouse gases involve the automobile, we rejected certain sites such as Detroit that are economically dependent on the automobile industry.

e) Finally, each site had to be large enough to have a recruiting agency that could bring together enough people to meet our quotas. After establishing quotas based on sex, race and education for each site, we used them as recruiting specifications for the organizations working with us to recruit respondents.

After taking all this into consideration, we chose the following sites:
Nashville, TN to represent the South;
Chicago, IL to represent the Midwest;
Los Angeles, CA to represent the West; and
Hartford, CT to represent the Northeast.

When the research was completed and the sample was aggregated, we compared it to national totals of certain variables, including some, such as political party, that were not part of the recruiting specifications but which, in a well drawn sample, should match the national totals within a few percentage points. All discrepancies between the mean score for any site and region resemble normal sample variations using a national probability sample of 402 respondents. As is standard procedure using even national probability samples drawn using both listed and unlisted telephone numbers, we then weighted the data to bring the demographics more into line with the national totals. The only variables where the number of respondents differed significantly from the recruiting specifications were education (in that the panel included more respondents with "some college" and fewer with a "high school education or less" than the quotas called for) and the income (in that panel included fewer respondents with an annual family income of $30,000 or less and more with an income of $30,000 to $50,000). In Table 41, we show the weighted sample compared to the quota used to recruit respondents. In Tables 42 and 43, we present the weighted and unweighted data compared to national totals determined by U.S. Census data and the three ATS surveys. (See Tables 41 to 43.)

TABLE 38
Targeted Panel Composition by Region

Area	Population	U.S. Pop.	Quota	Actual Sample	Sample Size
	(in millions)	%	%	%	(respondents)
National Total	239	100	100	100	402
Northeast	50	22	22	21	84
Midwest	59	25	25	24	97
South/West Central	82	34	34	33	133
West	48	20	20	22	87

TABLE 39
National Distribution By Age Group

Age	ATS #1	ATS #6	ATS #12	3 Survey Average
	%	%	%	%
18 to 29	26	22	22	23
30 to 39	21	24	22	22
40 to 49	19	17	19	18
50 to 64	19	19	19	19
65 and over	15	17	18	17

* Due to rounding, percentages may not always add to 100%.

TABLE 40
Targeted Panel Demographics By Region and Site

Region/Site	Race			Education			Income
	Black/ Afr-Amer	White	Hispanic	12 yrs or less	12-16 years	16+ years	Median Family
	%	%	%	%	%	%	(1985)
National Total	12	83	6	34	50	16	$19,917
Northeast	10	86	5	33	50	17	$20,651
Hartford, CT.	7	90	4	30	50	20	$23,372
Midwest	9	89	2	32	53	15	$20,988
Chicago, IL.	20	74	8	33	49	18	$24,514
South	19	78	6	40	45	15	$17,857
Nashville, TN.	16	83	1	36	47	17	$19,654
West	5	81	15	26	55	19	$20,974
Los Angeles, CA.	9	74	24	28	54	18	$21,744

* Due to rounding, percentages may not always add to 100%.

TABLE 41
Comparison of Quotas to the Weighted Panel Sample

		Sample Quotas	Weighted Sample
		%	%
Region	Northeast	22	21
	Midwest	25	24
	South	34	33
	West	20	22
Sex	Male	50	50
	Female	50	50
Age	18-29	23	22
	30-39	24	24
	40-49	19	18
	50-64	19	19
	65/over	15	17
Education	12 yr. or less	34	37
	12-16 yr.	50	37
	16 yr./more	16	25
Race	Black/ African-American	12	7
	Hispanic	6	6
	White	83	84
	Asian	NA	2
Income	Less than $30,000	56	39
	$30,000-$50,000	27	39
	Over $50,000	17	21
Party	Republican	41	39
	Democrat	44	46
	Independent or other	15	15

* Due to rounding, numbers may not always add to 100%

TABLE 42
Comparison of U.S. Census Data to Unweighted and Weighted Sample
(U.S. Census and Panel)

		Unweighted U.S. Census	Weighted Sample	Sample
		%	%	%
Region	Northeast	22	20	21
	Midwest	25	25	24
	South	34	36	33
	West	20	21	22
Sex	Male	49	45	50
	Female	51	54	50

* Due to rounding, percentages may not always add to 100%

TABLE 43
Comparison of ATS Sample to Unweighted and Weighted Sample
(ATS and Panel)

		3 Survey Average	Sample Unweighted Results	Sample Weighted Results
		%	%	%
Age	18-29	23	23	22
	30-39	22	24	24
	40-49	18	18	18
	50-64	19	19	19
	65/over	17	15	17
Education	12 yr. or less	46	25	37
	12-16 yr.	26	47	37
	16 yr./more	27	24	25
Race	Black/Afr-Amer	10	11	7
	Hispanic	3	8	6
	White	84	80	84
	Asian	1	2	2

* Due to rounding, numbers may not always add to 100%

Demographic Sources:

Americans Talk Security #1, Marttila & Kiley, October, 1987.

Americans Talk Security #6, Marttila & Kiley, May, 1988.

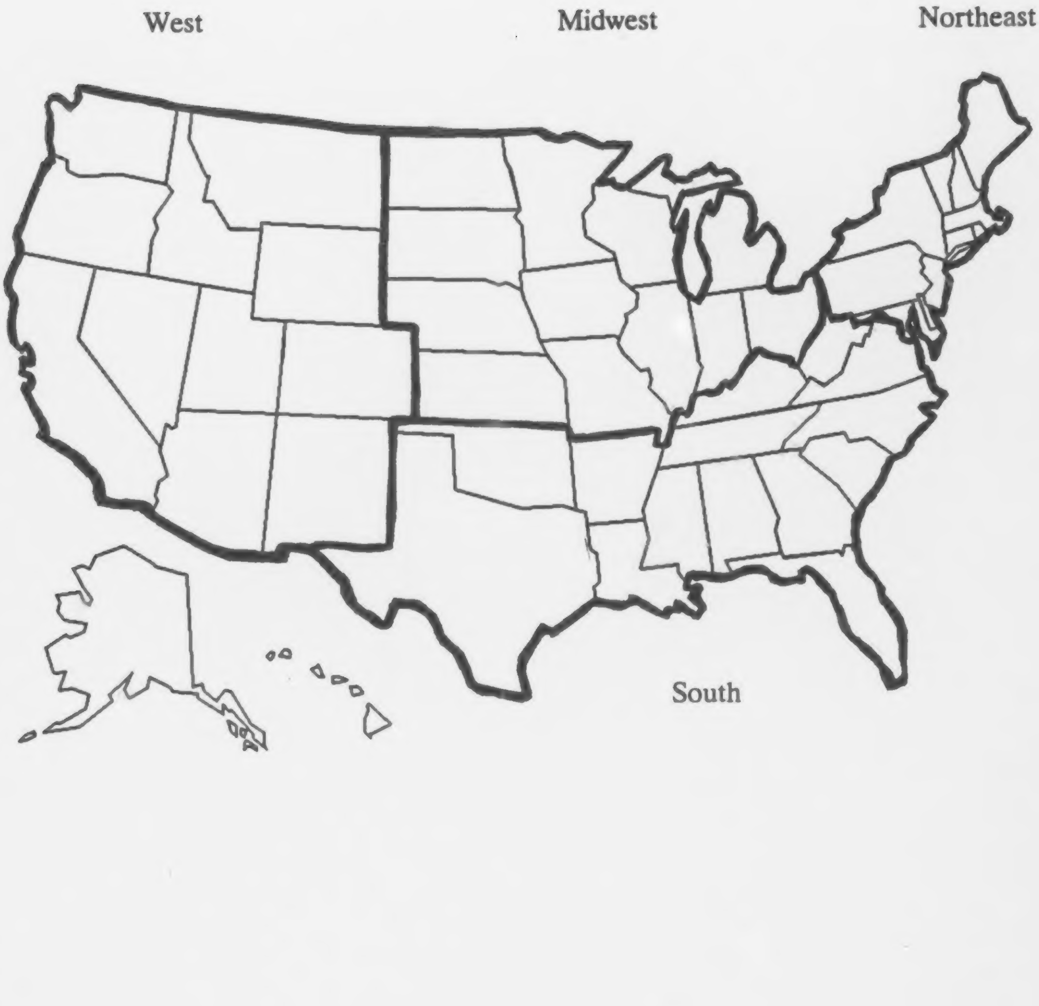
Americans Talk Security #12, Market Opinion Research, January, 1989.

1986 State and Metropolitan Area Data Book, U.S. Bureau of Census, 1986.

1987 Statistical Abstract of the United States, U.S. Bureau of Census, 1987.

Diagram 1

Map of Regions


West
Midwest
Northeast
South

Appendix D:
The Leading Scientists

The Public Agenda Foundation interviewed a total of 418 of this country's leading scientists and other prominent members of the scientific community by mail between June 19, 1989 and September 11, 1989. Questionnaires with a cover letter and a self-addressed return envelope were sent out to 1500 leading scientists chosen at random by Research Projects Corporation of Woodbury, CT using *American Men And Women in Science, The 17th Edition*, by R.R. Bowker, *Who's Who in America* among other reference volumes. The rate of completed interviews returned from those originally sent out was 28 percent.

Scientist Demographics

		Percent of Sample %
Field of Science		
	Chemistry	24
	Biology/Health Sciences	21
	Earth sciences (including geophysics)	19
	Physics	19
	Social Sciences	6
	Engineering	4
	Computer Sciences	3
	All Other	5
Education Level		
	College graduate or less	4
	Some graduate school	14
	Ph.D. or post-doctoral work	82
Gender		
	Male	89
	Female	10
	Prefer not to answer	1
Political Party		
	Republican	26
	Democrat	37
	Independent	34
	Not sure	1
	Prefer not to answer	2

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Science and the Public: A Report in Three Volumes

Volume III:
Global Warming Caused by the Greenhouse Effect

SCIENCE AND THE PUBLIC: A REPORT IN THREE VOLUMES

Volume III: Global Warming Caused by the Greenhouse Effect

A Study for the Charles F. Kettering Foundation
Comparing the Perspectives of Citizens and Scientists

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Introduction

Science and the Public
Issues and Methods

In 1988, the Public Agenda Foundation, which is dedicated to enhancing the public's ability to resolve complex political and social issues, was asked by the Kettering Foundation, its collaborator and partner on numerous projects of common interest, to explore the public's capacity to think through policy issues that concerned matters of scientific or technological complexity.

Ongoing work of Public Agenda and Kettering had shown that exposure to brief, highly-focused, well-researched, educational interventions on contentious social or political problems can help the general public develop understandings and assessments that are often more realistic and consistent than earlier views. In the language of Public Agenda, the public can move from mass opinion -- top-of-the-head views -- to judgment, a more measured and thoughtful analysis.

The questions were: Could the same process hold for scientific issues that were threaded with uncertainty? Or were such technical issues intrinsically different from social or political problems, however contentious? Did issues of scientific complexity raise considerations that, in essence, were beyond the public's understanding?

As our first step, we carefully defined the kind of issue that would best illuminate the public's response to matters of scientific or technological complexity. With the aid of the Harwood Group, a research organization in Washington, D.C., which conducted a series of interviews with leading scientists, and decision makers (including, former EPA Administrator Lee Thomas, former White House Science Advisor George Keyworth and National Science Foundation Director Erich Bloch), we determined that the issue should have three characteristics:

1. Leading science and technology experts should be concerned about the ability of the public to grasp the issue.
2. Existing public opinion data should suggest that the public displays widespread misunderstanding of the issue.

3. Recent experience should suggest that policy debate on the issues has been marked by conflicting scientific or technological claims about the seriousness of the issue or the usefulness and/or safety of proposed solutions.

After further preliminary study, including eight focus groups with the general public (in Birmingham, Boston, Chicago, Houston, Nashville, New York, Omaha, and San Francisco), we chose to explore the public's thinking on two exemplary environmental issues: the disposal of solid waste and the threat of global warming caused by the greenhouse effects.

These issues form a good basis for analysis because they simultaneously have important similarities and important differences.

In terms of their similarities, both issues:

1. Are a source of sharp political controversy;
2. Are scientifically complex and packed with technical information;
3. Involve broad areas of scientific uncertainty or questions about which experts disagree;
4. Involve a certain degree of risk as well as difficult and controversial trade offs; and
5. Are subjects that leadership has found it difficult to communicate about with the public, both nationally and in various communities.

In terms of their differences, the two issues present clear contrasts:

1. Solid waste disposal is essentially a local issue while the threat of global warming caused by the greenhouse effect is national/international in scope.
2. Solid waste disposal is an immediate problem while the greenhouse effect is a long-term problem.
3. Solid waste disposal poses serious but essentially moderate risks while the greenhouse effect has the potential to be catastrophic.

4. Solid waste disposal involves areas in which scientific uncertainty is rather narrow and clear cut (focusing mainly on incinerator safety) while the greenhouse effect is a subject in which high uncertainty and disagreement surrounds many elements, including the diagnosis of the problem, its potential effects, and when the effects may be felt.
5. The resolution of waste disposal and the greenhouse effect is likely to involve proposals or solutions that place different types of burdens on the general public (e.g., the public may regard a gasoline tax as more burdensome than recycling).

To investigate the public's opinions about the issues and its ability to think about them, we used a research method called a Citizen Review Panel, in which we examine people's views at two points in time: first, in the present, at their current, unenhanced level of understanding -- that is, their top-of-the-head opinions and second, after they have had a chance to learn about an issue, its causes, various possible solutions, the costs, risks, and trade-offs associated with it, and about the specific areas that are marked by scientific/expert uncertainty or disagreement. The second set of views represent, in other words, the public's more considered judgment. In general, a comparison between the first and second views may indicate whether the public is handling an issue with increased thoughtfulness and sophistication, and suggest the direction in which the public will move when given a more thorough discussion of the issues.

Four hundred and two respondents from four cities -- Chicago, Hartford, Los Angeles, and Nashville -- were chosen to reflect a cross section of the noninstitutionalized, voting age population of the United States. During the period from September 25 to October 13, 1989, a group of respondents met in each city for a three-hour session.

Each Panel consisted of the following segments:

1. Panel members filled out a "pretest" questionnaire that asked them to rate the urgency of the two environmental issues among a list of national problems and to evaluate a wide variety of possible actions to deal with the issues.

2. Panel members next watched a fifteen minute video describing in a balanced way the issue of solid waste disposal and the four principal solutions to the problem (source reduction, recycling, incineration, and landfill), with pro and con arguments for each solution.
3. Panel members broke up into groups of about twelve to discuss the issue.
3. After a short break, panel members reconvened to watch a second video that presented the threat of global warming in a balanced way, went on to discuss what experts do and do not agree on, and described an assortment of proposals to reduce the buildup of greenhouse emissions, with the pros and cons of each proposal.
5. The panel broke up again into groups of about twelve people each to discuss the greenhouse effect for about forty-five minutes.
6. Finally, panel members filled out a "posttest" questionnaire in which they were asked the same questions contained in the pretest questionnaire.

In short, the project had the opportunity to examine respondents' views on waste disposal and possible global warming before and after they learned more about the issues, their causes, their possible effects, and the costs, trade-offs, and sacrifices that were involved in their possible solutions. In analyzing the two sets of views, we focused on the types of changes that did and did not occur, the reason for the change, and what they revealed about the public's more general response to issues of scientific complexity.

As part of our analysis, we wanted to compare the views of the panel respondents with the views of leading scientists. How close together or far apart were the public and experts? We sent a lengthy questionnaire, using many of the same items asked of the panel respondents, to 1,620 of the country's leading scientists. Four hundred and eighteen scientists responded, a return rate of just under 26 percent.

These data, the findings of the Citizen Review Panels and the responses on the scientist's questionnaire, are the basis for the three volumes that comprise the *Science and the Public*.

Volume I focus on the public's response to scientifically complex issues in general. It attempts to answer the question at the heart of the project: How does the public understand and analyze policy questions involving elements of scientific and technological complexity?

Volume II reports on findings related to the disposal of solid waste.

Volume III reports on views on the threat of global warming.

Executive Summary

The Research Method

Over a three week period in September and October, 1989, a panel of 402 people from four metropolitan areas (Hartford, Nashville, Chicago and Los Angeles) chosen to represent a cross section of the population of the U.S. was brought together in groups of about 50 for three-hour sessions in which they: a) filled out a lengthy questionnaire (the pretest) about the disposal of solid waste and the threat of global warming; b) watched a twenty minute film made by Public Agenda about the issue of solid waste disposal; c) broke up into groups of about 12 to discuss the issue for about thirty minutes under the guidance of a Public Agenda staff moderator; d) reconvened (after a short break) to watch a second film about the threat of global warming; e) again broke up into small groups to discuss that issue for about 45 minutes; and f) filled out a second questionnaire (the posttest) which included all of the items asked in the first questionnaire.[1]

1. While national awareness of the term "greenhouse effect" has increased, there was widespread confusion in the panel about almost the entire issue, including the causes of possible global warming and what can be done to reduce the buildup of greenhouse gases.

Recent national surveys, including one conducted for the Union of Concerned Scientists in November, 1989, confirm what this study found: public awareness of the term "greenhouse effect" has increased sharply over the past couple of years. However, the panel's responses also suggest that there is widespread public misunderstanding about virtually every aspect of the issue, including the causes and possible effects of the buildup of greenhouse gases, and what can be done to deal with the problem.

2. Despite fragmentary knowledge, the panel favored immediately implementing seven of twenty-five proposals to reduce the buildup of greenhouse gases. However, support for these measures stemmed from concern about the environment as a whole, NOT from concern about the greenhouse effect.

In the pretest, before learning more about the issue, majorities favored taking a number of actions to deal with the buildup of greenhouse gases. However, in the discussion, it became clear that most of the group's initial support was rooted in concern about the environment as a whole, not about the greenhouse effect per se. In the pretest, the panel favored:

- Giving tax incentives to homeowners who improve insulation even if that means a modest tax increase: 61 percent;
- Requiring businesses to improve fuel efficiency even if that would increase the price of their products: 59 percent;
- Giving tax incentives to builders to use passive solar energy even if that means a modest tax increase: 56 percent;
- Increasing the mileage standard for new cars to 40 mpg by the year 2000 even if that means higher prices and decreased performance: 55 percent;
- Requiring that communities plant more trees even if that means a modest tax increase: 55 percent;
- Giving tax incentives to industries that improve insulation even if that means "giving them large tax breaks:" 55 percent; and
- Having the U.S. take the lead in international efforts to address the greenhouse effect even if American companies and citizens would have to make more sacrifices than people in other countries: 55 percent.

3. In both the pretest and posttest, the panel did NOT think that global warming caused by the greenhouse effect would be catastrophic, at least by the year 2050, and so its willingness to sacrifice was not based on a "doom and gloom" forecast.

The panel's willingness to act to reduce greenhouse gases was not based on a cataclysmic view about possible global warming. Both before and after the intervention, the panel felt that warming caused by the greenhouse effect would probably be gradual and have "moderate" effects, at least until the year 2050. It seems reasonable to surmise that the panel's less than cataclysmic view of the greenhouse effect explains why a majority favored a comparatively modest approach to the issue. However, a large number did think that global warming caused by the greenhouse effect has begun.

4. As the group's understanding increased, so did its willingness to sacrifice; in the posttest, larger numbers favored most of the proposals that were endorsed initially.

In the posttest, the panel endorsed all of the proposals it favored initially, often in larger numbers. Support increased significantly for the following:

- Increase the mpg standard to 40 for new cars by 2000: to 75 from 55 percent;
- Require businesses to improve fuel efficiency: to 70 from 59 percent;
- Have the U.S. take the lead in international efforts: to 70 from 55 percent; and
- Require communities to plant more trees: to 68 from 55 percent.

5. Six proposals that received minority support in the pretest were favored by a majority after the intervention.

In addition to the seven proposals endorsed initially, a majority of the panel favored six additional measures after learning more about the threat of global warming:

- Reducing the number of trees that can be cut in the U.S. even if that increases the cost of paper products and puts some companies out of business: 69 percent;
- Increasing government funding for solar energy research even if that means a modest tax increase: 67 percent;
- Requiring utilities to burn less coal even if many coal miners would lose their jobs: 63 percent;
- Increasing government spending on mass transit even if that means a modest tax increase: 59 percent;
- Increasing the mileage standard for new cars to 50 mpg by the year 2000 even if that means sharply higher car prices and decreased performance: 59 percent; and
- Reimposing and strictly enforcing a 55 mph speed limit: 52 percent.

6. However, a number of other measures, including building more nuclear power plants, were rejected, even in the posttest.

While a sizable minority was in favor, the panel rejected five additional proposals:

- Building more nuclear power plants even if that means living with the risks posed by that technology: 45 percent;
- Drilling for natural gas offshore: 43 percent;

- Giving more aid to countries like Brazil to stop destroying rain forest even if that means increasing foreign aid: 38 percent;
- Taxing "gas guzzlers" even if that raised the price of station wagons and full-size cars: 37 percent; and
- Drilling for natural gas in national parks: 32 percent.

7. Certain proposals, especially those felt to be a "tax on necessities," such as a tax on home heating oil and a gasoline tax were soundly rejected in the posttest.

In the posttest, seven proposals received very little support, suggesting that no matter how much the public learns about the issue and even if scientists discover that the greenhouse effect will have catastrophic effects, some measures will be rejected, including:

- Banning cars that get low gas mileage: 25 percent;
- Requiring people to keep their thermostats at 65 degrees: 30 percent;
- Taxing homeowners use of heating oil: 17 percent;
- Imposing a ten cents a gallon gas tax in each of next 10 years: 11 percent;
- Imposing a 25 cents a gallon gas tax: 11 percent;
- Imposing a special tax on two-car families: 11 percent; and
- Rationing gasoline (alternate day buying): 7 percent.

8. The 418 leading scientists surveyed also did not think that global warming would be catastrophic, at least by the year 2050. That is, their forecast was quite consistent with the panel's.

The scientists were asked how bad they thought global warming was likely to be. Most felt that any climate changes resulting from global warming would be "gradual" and "incremental," at least until the middle of the next century. Asked whether global warming had begun, 40 percent said it had but 47 percent were not sure.

9. The scientists' views about reducing greenhouse gases were remarkably similar to those of the panel as expressed in the posttest.

In spite of their less than cataclysmic forecast, the scientists felt we should take immediate action to reduce the buildup of greenhouse gases. With the exception of four proposals (discussed below), all of the measures deemed acceptable by a majority of scientists were also acceptable to the panel in the posttest; in addition, all but two of the proposals the scientists rejected were also rejected by the panel in the posttest. That is, on nineteen of the twenty-five proposals, majorities in both groups were in agreement, and on two others, the panel was in favor while the scientists were not.

10. The scientists favored four proposals that the panel rejected in the posttest, notably a tax on gas guzzlers and using more nuclear power.

There were four proposals that the scientists but not the panel favored:

- Taxing "gas guzzlers" (favored by 75 percent of the scientists and 37 percent of the panel);
- Building more nuclear power plants (favored by 68 percent of the scientists and 45 percent of the panel);
- Giving more aid to countries like Brazil if they stop destroying the rain forest (favored by 50 percent of the scientists and 38 percent of the panel); and
- Imposing a 25 cents a gallon tax on gasoline (favored by 50 percent of the scientists and 11 percent of the panel).

11. In sum, while the panel was not as willing to sacrifice to the extent that some environmentalists might hope, it was, especially after learning more about the issue, far more willing to sacrifice to reduce greenhouse gas emissions than the President or Congressional leaders might expect.

In the posttest the panel supported a variety of measures to reduce the buildup of greenhouse gases, including proposals that would raise taxes and prices and thus increase inflation and result in a loss of jobs for workers in certain industries. With a few exceptions, the panel's views about what the country should and should not do to address the threat of global warming was remarkably consistent with the views of more than 400 of the country's leading scientists. Taken together, the results of this study show what a cross section of Americans want to do about the greenhouse effect after they learn more about it and:

- In the face of considerable uncertainty;
- In view of the sacrifices involved; and
- Based on an assessment of the threat that is consistent with the views of over 400 of the country's leading scientists.

As such, the results of this study deserve serious consideration.

The Pretest:

The Panel's Initial Assessment Of The Threat Of Global Warming

1. While national survey data show that public awareness of global warming caused by the greenhouse effect is increasing, many panel members misunderstood the reasons for the buildup of greenhouse gases, a result that suggests the public's understanding of this issue is at best fragmentary and incomplete.

In the pretest, prior to learning more about the issue in the intervention, 76 percent of the panel said they had heard or read about the greenhouse effect. This level of awareness is consistent with results in a November, 1989 nationwide survey conducted for the Union of Concerned Scientists in which 79 percent had heard or read about what they referred to as "global warming sometimes called a 'greenhouse effect.'" Both sets of results, in turn, show that national awareness about the greenhouse effect has increased significantly over the past year or so. For example, in an October, 1988 nationwide survey by Kane, Parsons and Associates, only 58 percent had heard or read about the greenhouse effect. (See Tables 1, 2, and 3.)

However, when asked in the pretest to identify the "major causes" of the greenhouse effect, a solid majority of the panel correctly named only one: pollution from business and industry, cited by 77 percent. While narrow majorities (52 percent each) did correctly name automobile exhaust and the destruction of tropical forests, large minorities incorrectly said that pesticides (39 percent) and nuclear power plant emissions (37 percent) are each a major cause of the problem. Fewer than one in three (32 percent) correctly named the use of coal by utilities or electric companies, and only 10 percent of the panel correctly said that people heating and cooling their homes was a major cause of the greenhouse effect. (See Table 4.)

2. While most respondents had heard about the greenhouse effect, they initially did not express great concern about it.

In the pretest, a majority of the respondents were not very worried about the threat of global warming caused by the greenhouse effect. When asked if they personally worried about the issue, only 10 percent said they worried a great deal, while an additional 28 percent said they worried a fair amount. The rest either worried "only a little" (33 percent) or "not at all" (13 percent), while a large number (17 percent) were not sure. (See Table 5.)

Respondents were also asked how serious they thought various national issues were. Seven issues were felt to be more important than the threat of global warming. While 47 percent said the greenhouse effect should be a "top priority",[2] 79 percent said that fighting illegal drug use should be a top priority. There was also more support among the panel for reducing smog, stopping the destruction of the ozone layer, fighting the spread of AIDS, reducing the federal budget deficit, reducing emissions that cause acid rain, and increasing the amount of garbage we recycle than there was for acting to combat global warming caused by the greenhouse effect. (See Table 6.)

Nor did most respondents think the greenhouse effect would have devastating effects on the environment, at least over the next fifty to sixty years. When asked if they thought the greenhouse effect would "cause widespread flooding, famine and environmental devastation," or "slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow," a plurality, 48 percent, thought the change would be slow, and more than one-third, 34 percent, were not sure. Only 18 percent said they thought the greenhouse effect would lead to environmental devastation even by the year 2050. (See Table 7.)

Proposals That Were Acceptable to a Majority Before the Panel Learned More About the Greenhouse Effect

1. Despite the fact that the panel was not overly worried about the greenhouse effect, it wanted the U.S. to take the lead in international efforts to address the issue without waiting for other countries to act.

In the pretest and posttest, respondents were asked how they felt about twenty-five proposals to reduce greenhouse gases. Each had an accompanying sacrifice or trade-off.[3] The proposals involved various sectors of the economy including business and industry, utility companies, automobiles and the auto industry, the use of home heating oil, alternative energy sources such as nuclear power, and deforestation. Some proposals involved taxation, others imposed requirements, while still others meant an increase in government funding. With each proposal, respondents had four choices. They could:

- Implement it immediately;
- Phase it in gradually, over the next ten years or so;
- Implement the proposal only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050; or
- Oppose implementing the proposal, no matter how catastrophic new evidence suggests that global warming caused by the greenhouse effect will be.

Respondents were asked if they thought the U.S. should take the lead in international efforts to address this issue even if that meant Americans would have to make more sacrifices than people in other countries. In the pretest, before learning more about the issue, a majority of 55 percent favored the U.S. taking such a lead either immediately (26 percent) or more gradually, over the next decade (29 percent). Since understanding of and concern about the greenhouse effect were low in the pretest, we believe that this result stems more from concern about the environment in a general sense than about the greenhouse effect per se. (See Table 8.)

2. In the pretest, a majority favored implementing six other measures to reduce the buildup of greenhouse gases. However, support for these measures did not stem from concern about the greenhouse effect.

In the pretest, a majority of the panel favored immediately implementing or phasing in seven of twenty-five proposals to reduce the emission of greenhouse gases. In addition to having the U.S. take the lead, the panel in the pretest supported:

- Giving tax incentives to homeowners who improve insulation even if that means a modest tax increase: 61 percent;
- Requiring businesses to improve fuel efficiency even if that would greatly increase the price of their products: 59 percent;
- Giving tax incentives to builders using passive solar energy even if that means a modest tax increase: 56 percent;
- Increasing the mileage standard for new cars to 40 mpg by the year 2000 even that means higher car prices and decreased performance: 55 percent;
- Requiring communities to plant more trees even if that means a modest tax increase: 55 percent; and
- Giving tax incentives to industries that improve insulation even if that means "giving them large tax breaks:" 55 percent. (See Table 9 and Chart 1.)

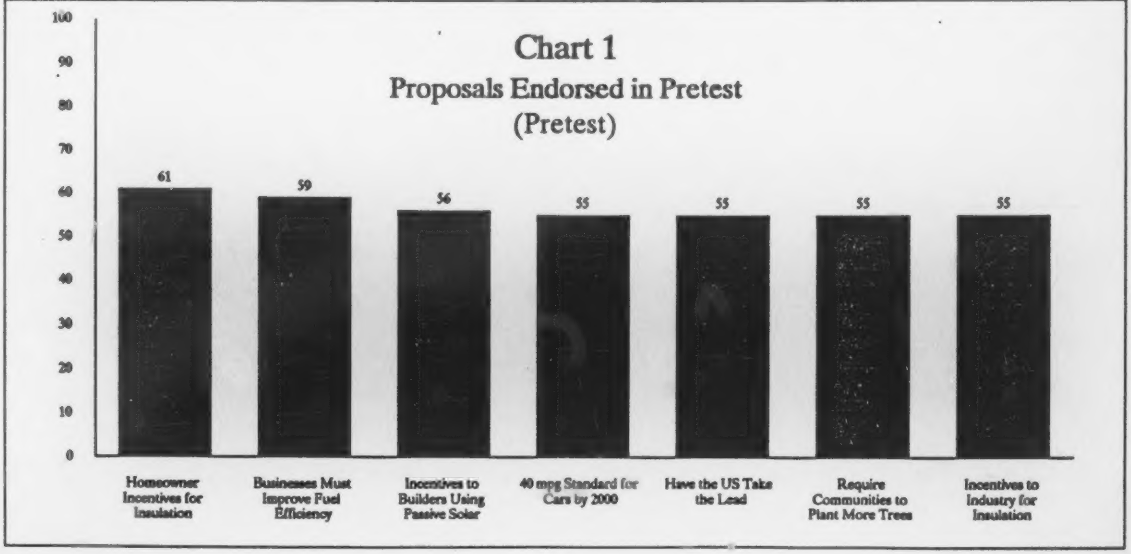
Chart 1
Proposals Endorsed in Pretest
(Pretest)

As noted above, awareness of the term "greenhouse effect" was fairly high; but understanding of and concern about the issue were low, especially in the pretest. And comments in the discussions made it clear that, even after learning more about the issue, many respondents had an incomplete understanding of many aspects of the issue.[4] Therefore, we believe that pretest support for particular proposals was the result of a confluence or coming together of several concerns, only one of which involved the greenhouse effect. As comments from the discussion will reveal, support for a proposal even after the intervention often stemmed less from concern about global warming, and more from at least one of the following:

- Concern about the environment in a general sense;
- Concern about issues related to the greenhouse effect such as air pollution or the energy crisis; and
- An endorsement of the proposal for other reasons (such as improved cost-efficiency or aesthetics), independent of the threat of global warming.

3. A majority of respondents favored providing tax incentives to homeowners who increase insulation and improve energy efficiency in the home.

The panel was told that reducing the amount of energy used to heat and cool the home could reduce the emission of greenhouse gases in two ways: first, oil, coal, and to a lesser extent, natural gas give off carbon dioxide when burned and so if less were used to heat the home, less carbon dioxide would be emitted; second, to the extent that utilities rely on fossil fuels to generate power, they too are a source of greenhouse gases, but by reducing demand for electricity (and thereby decreasing the amount of power utilities have to generate), they too would burn less fossil fuel and emit fewer greenhouse gases. Respondents were therefore asked to evaluate a number of proposals designed to change the way we heat and cool our homes.

In the pretest, even before learning more about the threat of global warming, a major focus of respondents' concern was more efficient use of energy in the home. A 61 percent pretest majority favored offering tax incentives to encourage homeowners to improve their home insulation even if that would mean a tax increase of about $50 per year per taxpayer (which would equal almost five billion dollars in federal expenditures).[5] The group was divided over whether to implement this measure immediately (31 percent) or phase it in gradually over the next ten years (30 percent). (See Table 10.)

The panel also favored providing tax incentives to builders who construct homes and offices to take advantage of sunlight or passive solar energy. This proposal, also designed to reduce heating costs/use and the use of electricity generated by utilities, was favored by 56 percent in the pretest even if it too meant a $50 per year tax increase for every taxpayer. (See Table 10.)

However, comments in the open-ended discussions lead us to conclude that most of the pretest support for these measures stemmed less from concern about global warming than from enthusiasm about energy conservation in a general sense. For example, when we asked the panel to consider these proposals after the intervention, a number of people talked about how they had improved their own home insulation and, in the process, saved lots of money on their monthly heating and electric bills. That is, even after they learned how these proposals would reduce the emission of greenhouse gases, most respondents still saw the proposals as sensible, cost-effective economy steps that homeowners and builders would be wise to consider, and favored the proposals primarily for that reason. Indeed, a number of respondents who had previously insulated their homes were concerned about making sure that any such tax credits would be provided retroactively so that people like themselves would not be "penalized" or treated unfairly, and so that they too would be able to take advantage of any tax savings. In sum, even after the intervention, perceived benefits in terms of the energy crisis and long-term savings to homeowners and renters made these proposals worthy of support. On top of those positive aspects, the reduction of greenhouse gas emissions was like icing on the cake.

4. Respondents also favored measures to increase energy efficiency in business and industry.

To the extent that business and industry use energy sold by utilities that burn fossil fuels, they too contribute to the buildup of greenhouse gases. If business and industrial demand were cut, utilities would have to generate less power. Additionally, businesses that burn fossil fuels themselves, either for heat or as part of the manufacturing process, also contribute to the problem. For this reason, respondents were asked to consider several proposals aimed at increasing energy efficiency in business and industry.

In the pretest, a solid majority of 59 percent favored requiring businesses to improve fuel efficiency or use less energy, " even if that would greatly increase their costs and the price of their products." However, only 19 percent wanted to impose such requirements immediately; almost certainly recognizing that increasing efficiency would be expensive, at least in the short run, most of those in favor (40 percent of the total sample) wanted to phase this measure in over the next decade or so. (See Table 11.)

A pretest majority, 55 percent, also supported offering tax incentives to industries that increase insulation and energy efficiency "even if that would mean giving them large tax breaks." One in four thought that such incentives should be implemented immediately, and 30 percent wanted to phase them in over the next ten years. (See Table 11.)

Both results, when taken together, suggest that a pretest majority favored both of what might be called a carrot and stick approach. Majorities favored requirements and tax incentives. These results also suggest underlying concern about the energy situation along with faith in the long-term value of conservation. When these proposals were discussed, several respondents suggested that they would pay for themselves, that the resulting efficiencies would eventually lower a business's operating expenses enough to offset any temporary costs. And so we see again that even after learning about the relationship of these proposals to the greenhouse effect, many respondents evaluated them not in terms of the threat of global warming but in cost-benefit terms, as if the topic under consideration were the energy crisis or the how to increase a business's competitive posture in the long term.

5. In the pretest a majority of respondents also favored increasing the miles-per-gallon requirement on new cars to 40 mpg by the year 2000.

Respondents were told that automobile exhaust accounts for nearly one-third of carbon dioxide emissions generated in the U.S.,[6] and so the group was asked about a variety of proposals aimed at reducing gasoline consumption and changing Americans' use of the automobile. In the pretest, a majority of respondents favored raising the mpg requirement for new cars to a fleet-wide average of 40 miles per gallon by the year 2000 "even if that would increase the price of new cars and decrease the performance of full-size cars and station wagons." Fifty-five percent supported this measure. (Since the proposal itself calls for a phase-in over the next decade, we did not distinguish between those who favored immediate implementation and those who wanted to phase it in over the next ten years.) (See Table 12.)

Again, however, comments in the discussion suggest that especially in the pretest but also after the intervention, much of respondents' support for this measure did not stem from concern about the buildup of greenhouse gases. As we discuss later, many felt that increasing gasoline mileage could be accomplished at little expense to auto makers and with only moderate changes in a car's size and performance; the idea was also popular because people thought it would both save energy and reduce the costs of operating a new car.

6. In the pretest, the panel wanted to require communities to plant more trees even if that would mean a tax increase.

Through the process of photosynthesis, plants absorb carbon dioxide, the most abundant of the greenhouse gases, and convert it into oxygen. Therefore, respondents were asked to consider several proposals involving trees, including measures to curb the destruction of tropical rain forests and to limit deforestation in the U.S. In the pretest, a majority favored one proposal in this area: a requirement that communities plant a large number of new trees each year, even if that would mean a $50 per year tax increase for each taxpayer. A solid pretest majority of 55 percent was in favor, with support divided between those who favored immediate implementation (28 percent) or phasing in the measure over the next decade (27 percent). (See Table 13.)

However, as with the other five proposals favored by a majority in the pretest, support for this measure was again largely unrelated to concern about global warming. In the discussion, after the film and moderator explained that trees and other green plants "recycle" greenhouse gases and that the amount of carbon dioxide in the atmosphere is directly related to the number of trees in the world, it was clear that many panel members still did not fully understand the connection, let alone bring a prior understanding to the pretest. As we discuss at length later in the report, even after learning more about the issue, numerous respondents favored this proposal primarily because they thought that planting more trees would beautify the urban landscape.

7. Taken together, these results suggest that the public will support a variety of measures to reduce the buildup of greenhouse gases at the present time, without learning more about the issue.

Since the panel had limited prior knowledge about the issue, we feel that support for the seven proposals endorsed in the pretest could not possibly stem from awareness of or concern about the threat of global warming; rather, we believe that respondents favored these measures for a variety of reasons including:

- Concern about air pollution or the environment in a general sense;
- Concern about the cost and supply of energy;
- The belief that conservation eventually pays for itself; and
- The value of the proposals' own merits.

But whatever the reasons, respondents' pretest support for these proposals was largely unrelated to their concern about the greenhouse effect. Importantly, therefore, we are led to a larger conclusion: to the extent that the panel is representative (which it was designed to be), the results suggest that a solid majority of Americans will support a host of measures to reduce the buildup of greenhouse gases at the present time, without learning more about the issue, without clearly understanding the issues complexities and interrelationships, and regardless of the extent of expert disagreement and scientific uncertainty. In sum, the results suggest that to a very considerable extent, the public is primed to take certain kinds of action right now.

The Intervention

The film described what scientists know about the threat of global warming caused by the greenhouse effect, including the variety of greenhouse gases and their sources, the steps that might be taken to reduce the buildup of greenhouse gases and the trade-offs involved with each one. In addition, it discussed the main questions about which scientists are not sure or disagree, including when, if ever, global warming will start, and what the effects might be.

The film briefly explained that the earth is surrounded by a layer of gases including carbon dioxide[7] that acts like a natural greenhouse, allowing the sun's rays to pass through, but not permitting all the heat generated from the sun to escape back out.

> Now, in itself this is not a problem. In fact, if we did not have this sort of natural greenhouse, the earth would be about 60 degrees cooler than it is, and life as we know it would not be possible. [But] the problem is that a variety of the things we do, from driving cars, to burning coal and oil to make electricity, to destroying forests and clearing land, especially in South America and Africa, all combine to increase the amount of carbon dioxide and other greenhouse gases that we are putting into the atmosphere. And as the world's population continues to grow, and we do these things more and more, scientists believe that our greenhouse shield will become more dense and eventually more heat will be trapped inside the atmosphere, making the earth warmer. If this happens, scientists predict, the average daily temperature will rise and that could create all kinds of problems.

The film then detailed what our research showed were the two predominant views that scientists hold about the likely effects of global warming.

> But just what kind of problems, and when we might feel their effects, is something about which scientists disagree. Some paint a grim picture. They say over the next 50 years or so, we will see severe changes in our

> climate and our environment. They predict, for example, that these rising temperatures will melt polar ice caps, causing the level of the oceans to rise so high that coastal cities like New Orleans might well end up underwater. And, they say, there could be changes in climate so severe that places like the American midwest could become a vast dust bowl, unable to sustain crops, and that severe drought, famine and the diseases they cause will become facts of life in many places around the world.
>
> But other scientists believe that global warming will be more moderate, and that it will occur gradually, over a longer period of time, say the next 75 to a 100 years instead of the next 50. These scientists predict that the effects of global warming, though dramatic, will not be catastrophic. They predict, for example, that instead of growing corn in Nebraska and Iowa as we do now, the weather will gradually warm, rainfall patterns will change, and we will eventually start growing our corn in more northern states like Minnesota and South Dakota. And while this group of scientists agrees that some polar ice caps may melt, they think the sea level will rise only slightly, enough to flood some marshes and wetlands, but not enough to flood a city.

In the discussion, the moderators suggested that the way scientists feel about this entire issue parallels how they feel about one aspect of the solid waste issue: the safety of incinerators (which was discussed earlier in the evening).[8] Respondents were told that most scientists fall into one of three groups: a minority who believes that global warming will be catastrophic; a majority who thinks that at least for the next fifty years or so, the effects of global warming will be more moderate; and a third group, a "fair number," who simply aren't sure which view is correct.[9] The moderators then reviewed the material in the film and encouraged the respondents to consider the different alternatives, their costs, and their benefits.

Specifically, the panel was asked to consider five areas where we could reduce greenhouse gas emissions:

- Reducing consumption of gasoline;
- Changing the way we heat and cool our homes;
- Requiring or encouraging business and industry to use less fossil fuel;
- Using alternative fuels that contribute fewer or no greenhouse gases (including natural gas, nuclear power, and solar energy); and
- Planting more trees and cutting down less forest.

In each area, the group discussed arguments for and against the implementation of specific proposals.[10]

The Posttest:

The Assessment of the Threat of Global Warming

1. Although some confusion remained, the panel's understanding of the greenhouse effect and its causes increased dramatically after the intervention.

After the intervention, respondents' understanding of the major causes of the greenhouse effect increased significantly. In the posttest, much larger numbers understood that automobiles (80 percent, up from 52 percent in the pretest) and heating and cooling the home (39 percent, up from 10 percent) are "major causes" of the buildup of greenhouse gases. Much larger numbers also correctly cited the use of coal by utilities (71 percent, up from 32 percent) and the destruction of tropical forests (78 percent, up from 52 percent). In addition, the number correctly saying that nuclear power plants do not contribute to the problem of greenhouse gas emissions rose from 19 percent in the pretest to 57 percent in the posttest. (See Table 14.)

However, even after the intervention, there was still confusion about several aspects of the problem. Even in the posttest, for example, a significant minority (36 percent) continued to hold that nuclear power plants are at least a "minor cause" of the greenhouse effect in spite of the fact that the film and the moderator in the discussion clearly explained they are not. A narrow posttest majority (51 percent) also said that pesticides are either a major (22 percent) or minor (29 percent) cause of the greenhouse effect in spite of the fact that pesticides were not mentioned at all in the film or in the discussion. (See Table 14.)

Also, a number of respondents found it hard to understand the relationship of this issue to other air quality issues including air pollution and smog, the causes and consequences of acid rain, and the depletion of the ozone layer. To keep the discussion on track, moderators frequently had to say, "Now, we are not talking about air pollution in general, we are talking about the buildup of greenhouse gases, especially carbon dioxide, the colorless, odorless gas we exhale each time we breathe." Such continuing confusion leads us to infer that as public understanding of this issue increases, there will be a "piggyback effect" in that support for a particular solution will increase in both depth and breadth to the extent that the public thinks that it simultaneously deals with more than one environmental problem.

2. In spite of some trouble with details, the panel was able to grasp the essence of this issue after a relatively brief, straightforward explanation. More important, the panel was able to wrestle thoughtfully with numerous proposals to address the issue in full view of widespread scientific uncertainty about the nature and extent of the threat.

This study was based on one central premise: that a cross section of typical Americans could, after seeing a twenty minute film and engaging in about a 45 minute discussion, understand and intelligently evaluate the threat of global warming, an issue that is both technically complex and riddled with uncertainty. Much preliminary research went into this effort; and Public Agenda, like the Kettering Foundation, has years of experience in formulating and presenting complex policy issues so that typical citizens can understand and assess them. Nevertheless, until we carried out the research, we were not certain if, after a brief intervention, the panel would be able to grasp the essence of this issue, then reach a reasonable, logically consistent judgment about what, if anything, the country should do in response, especially when confronted with broad areas of expert disagreement and scientific uncertainty.

As both the quantitative and qualitative data in this report abundantly demonstrate, the panel of 402 citizens, designed to reflect the entire population in terms of education level, age, income, sex, race and geographic location, was capable of accomplishing both tasks: understanding and assessing what the country should and should not do regarding the threat of global warming. Perhaps equally important, respondents found it comparatively easy to grasp the concept of scientific uncertainty and, after some initial hesitation, most were able to comfortably discuss and decide what to do about the issue in the face of that uncertainty. Indeed, once they understood the concept, respondents seemed accustomed to the notion that scientists, like physicians and experts in many technical fields, routinely do not have the answers to particular questions at a given point in time. They saw that citizens and policy makers, who rely on the judgment of experts, often must decide what to do on the basis of incomplete information and lack of expert consensus.[11]

3. After learning more about the issue, the panel became more concerned but not alarmed about the threat of global warming.

After learning more about the issue including the steps needed to reduce the buildup of greenhouse gases, the panel expressed an increased level of concern about the threat of global warming. In the posttest, two-thirds said they worried about the greenhouse effect either "a great deal" (21 percent) or "a fair amount" (44 percent). The combined total of 65 percent represents a notable increase from the pretest when 38 percent expressed at least a fair amount of concern. In response to another posttest question, 64 percent said the greenhouse effect should be a top priority for national attention, again a significant increase from the number (47 percent) expressing this view in the pretest. (See Tables 15 and 16.)

However, even in the posttest, the greenhouse effect was ranked as a lower priority than several other national problems. That is, even after learning more about the issue in the intervention, respondents still named illegal drug use, AIDS, smog and the destruction of the ozone layer as higher priorities than the greenhouse effect. Along with other results, including comments from the discussion groups, this result suggests that though respondents' concern about the threat of global warming increased and while, as we shall discuss, they wanted to take a number of immediate steps to deal with the threat, their concern did not reach alarm proportions. One of the leading scientists surveyed for the project indicated that a major concern was an emotional overreaction; when it comes to the greenhouse effect, that scientist wrote, "Let's not push the panic button!" While learning more about the threat of global warming through the intervention did increase the respondents' level of concern, it clearly did not cause them to react in panic. (See Table 16.)

In addition to giving the issue less than the highest priority, the panel felt that the buildup of greenhouse gases would probably not be environmentally devastating, at least not by the year 2050.[12] In both the pretest and posttest, we asked the respondents to forecast how bad they thought global warming caused by the greenhouse effect was likely to be. There was not a statistically meaningful increase in the number saying global warming would be catastrophic by about 2050. About one in five in both the pretest and posttest (18 and 20 percent respectively) thought that the effects would be devastating by 2050. Much larger numbers (48 percent in the pretest and 62 percent in the posttest) said the effects would probably be slow and incremental, and even in the posttest, 18 percent weren't sure. That is, by a posttest margin of three to one (62 to 20 percent), the panel said the effects of global warming would probably not be devastating, at least by the year 2050. And so whatever actions the panel favored (which are discussed in detail in the following sections) were predicated on a less than cataclysmic assessment of the threat, an assessment that was in line with the view of the leading scientists. (See Table 17.)

4. When asked whether, in view of the widespread uncertainty about the issue among scientists and other experts, we should wait for further evidence before acting to slow the buildup of greenhouse gases, respondents overwhelmingly said we should act now. Indeed, most wanted the U.S. to lead international efforts even if that meant Americans would make more sacrifices than people in other countries.

As noted, most respondents did not think that global warming was likely to be catastrophic, at least until well into the next century. And even in the posttest, most did not rate the issue as highly as some others including drugs and AIDS. But when asked whether we should wait for more conclusive scientific evidence before dealing with the threat, the group said, by a posttest margin of 60 to 29 percent, that we should take decisive action now. That is, while the issue was not rated as the nation's highest priority and while it was not thought to present a cataclysmic danger, large majorities wanted to deal with the threat immediately rather than postpone action until scientists had a clearer understanding of the issue. (See Table 18.)

Panel members were also told that unlike solid waste disposal which is generally a local or state-wide problem, the threat of global warming endangers the whole planet and involves every nation. In both the pretest and posttest, respondents were asked whether the U.S. should take the lead in international efforts to deal with this threat even if that meant American companies and citizens would have to make more sacrifices than people in other countries. Fifty-five percent agreed with this view in the pretest, and a even larger number, 70 percent, agreed in the posttest, a 15 point increase. In a related question, 82 percent agreed that "the U.S. should take the lead in addressing the greenhouse effect without waiting for other countries to act." These posttest figures are consistent with a national poll which found that 72 percent thought that the U.S. should take the lead and 24 percent thought the U.S. should wait for international agreement. (See Tables 19, 20 and 21.)

Together then, the results reflect what a cross section of informed Americans want to do about the greenhouse effect:

- In the face of considerable scientific uncertainty;
- In full view of the sacrifices involved; and
- Based on an assessment of the threat that is consistent with the views of America's leading scientists as measured in our survey.

Therefore, we believe that the views of the panel should be given the most serious consideration in that they may forecast how the American people are likely to feel as they come to understand the issue more clearly.

5. Respondents wanted to take decisive action to address the threat of global warming for a variety of reasons.

In the discussions, respondents favored taking immediate action to address the threat of global warming for a variety of reasons. They felt that:

- Global warming had already begun;
- The threat was too grave to ignore;
- It is better to be "safe than sorry;"
- We have a responsibility to our descendants;
- Even small lifestyle changes would sensitize people to the issue (which would be helpful if more drastic steps are needed later); and
- While scientists may disagree about much of the problem, they do not disagree about whether the threat of global warming is real.

The panel generally accepted the fact that scientists were uncertain about numerous aspects of the greenhouse effect. However, most respondents also believed that global warming had begun, and this was one reason why they favored taking action now. Some attributed recent temperature fluctuations to the greenhouse effect. A Nashville area man said, "I don't think we should even be looking at the year 2050. The weather has been changing for the last two or three years. [The weather] is a lot different than it used to be even 25 years ago." Another man from that city said, "I think [global warming caused by the greenhouse effect] is coming faster than that one group [of scientists] thinks." When asked in the posttest whether they thought global warming caused by the greenhouse effect had already started, 73 percent said it had. (See Table 22.)

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--Nashville Man

Some respondents also favored taking action because of the magnitude of the danger. A man from Hartford said we should not wait "until there is a disaster or even a moderate disaster. We can grow corn in Minnesota for a while but what happens if [global warming] gets worse and worse?" A Los Angeles man said,"Regardless of whether or not [global warming] is there, the potential is there. It is potentially a lethal effect and we can't afford not to do something." And a man from the Chicago area said the entire issue was "kind of scary."

"You don't close the door after the horse leaves the barn. We can't wait to make these changes until it is too late."
--Hartford Man

Another commonly advanced reason for acting was a rationale that amounted to "better safe than sorry." A Hartford area woman said, "I think we should [take action] now. In a little while it might be too late." A woman from Nashville said, "If we overreacted, that would be better than to under-react." A man from Hartford said, "You don't close the door after the horse leaves the barn. We can't wait to make these changes until it is too late."

Some respondents talked about an obligation to descendants to act as caretakers of the planet and as protectors of the environment. A woman from the Nashville area said that even if global warming is not an immediate threat, we still should act now. "Even if we may not be here [when global warming begins]," she said, "we have children and grandchildren coming along, and we need to watch out for them."

Others argued that because drastic steps may be required in the future, we should make modest changes in our lifestyle now, arguing that such steps would sensitize people to the issue and prepare them in case more is required. A Hartford area man said, "I think we should start to do something now and get people to become more aware so that by the time we have to make real serious changes, people are ready for it." A Los Angeles area man said that it is easier to phase in changes than to try to make them abruptly. "You get into a situation where people have to learn to make changes. Like computers -- there are many older people who don't know how to use computers but if their company folds, they are going to have to learn."

Finally, some panel members argued that in spite of the widespread disagreement and uncertainty among scientists and experts, there are also areas of consensus. A man from the Hartford area said, "The scientists only disagree about the degree of the problem. They are all agreeing that there will be [a problem eventually]." A man from Nashville said, "[All the] scientists are saying something is going to happen but that we don't know what, and we don't know when. Let's act under the assumption that it will happen and try to prevent it. The sooner, the better."

6. Respondents were not paralyzed by expert uncertainty, in large part, we believe, because of the way in which the uncertainty was presented.

As noted earlier, in the discussion, the moderators said that the way scientists feel about the threat of global warming is similar to how they feel about the safety of incinerators (which had been discussed earlier in the evening),[13] and to the disagreement among doctors about the safety of eating red meat or sugar. In each case, the moderators said, there is a comparatively small number who foresee serious trouble or catastrophe, a majority who holds a more moderate view and doesn't believe the greenhouse effect (or red meat or solid waste incinerators) presents much of a danger, and a third group, what the moderators called a "fair number" of scientists who simply aren't sure which view is correct.

A number of panel members felt frustrated by this explanation and some, like a Los Angeles area man, simply found the idea of expert uncertainty hard to accept. "I would like to see some reports that say what is going on," he said. "How much will the temperature go up? How much will flood? Don't scientists know this stuff?" A man from the Chicago area said, "I think we should wait and see how much of an effect this is going to have [in view of the fact that] the scientists disagree if this is going to have a huge effect."

However, with those exceptions noted, a very large majority of the panel was not paralyzed; in fact, after they got over their initial frustration and understood the uncertainty in its context, most were able to decide rather quickly what the country should and should not do to deal with the threat of global warming. We believe the reason for this result is because of the way that the uncertainty was presented.[14]

1. The uncertainty was acknowledged by a credible source (the film and moderators);
2. The uncertainty was limited and those limits were explained;
3. The uncertainty was presented within the broader framework of the issue.

In the intervention, we emphasized both that scientists do not know all the answers and that they are the first to admit it. The fact that the scientists/experts were ready to admit their uncertainty did not seriously undermine the panel's respect for and confidence in science and scientists. In many cases, it seemed to have the opposite effect; respondents felt reassured and comforted to hear that experts knew they did not have all the answers, viewing it as an indicator of honesty and integrity.

Proposals That Were Endorsed by a Majority After the Panel Learned More About the Threat of Global Warming

1. After learning more about the greenhouse effect, a majority of the respondents wanted to implement thirteen of the twenty-five proposals to reduce the buildup of greenhouse gases, compared to only seven in the pretest. Four of these thirteen proposals involved the automobile.

In the pretest, respondents favored seven of the twenty-five proposals designed to reduce greenhouse gases (cf., above). However, after the intervention, there was increased support for many of the twenty-five proposals, and a majority of the panel favored implementing thirteen, four of which involved the automobile. (See Table 24 and Charts 2 and 3.)

In the film respondents were told that carbon dioxide is the principal greenhouse gas and that nearly one-third of the carbon dioxide generated in this country comes from auto emissions and from trucks and buses. The panel was asked to consider a variety of options to reduce auto emissions ranging from requiring car manufacturers to improve fuel efficiency, to imposing a gas tax, to gasoline rationing. The film and discussion covered arguments for and against each option, pointing out, for example, the high costs of retooling to improve auto efficiency, the expense of a gasoline tax, and the inconvenience of rationing.

In the pretest, 55 percent favored requiring auto manufacturers to increase the mpg standard for new cars to 40 miles per gallon by the year 2000. In the posttest, 75 percent favored this requirement, a 20 percentage point increase. In addition, a 59 percent posttest majority wanted to require auto manufacturers to increase the miles-per-gallon standard for new cars to 50 mpg by the year 2000, "even if this would sharply increase the price of new cars and decrease the performance of full-size cars and station wagons." In the pretest, only a minority, 39

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--Los Angeles Man

percent, favored a 50 mpg standard by the year 2000. So in the case of both mileage standards, posttest support was 20 points higher than support in the pretest. (See Table 24.)

Some favored these measures because they did not think there would be much of a trade-off, saying, for example, that auto industry "greed" is the main reason cars do not get better gas mileage today. A woman from the Nashville area said, "The technology [to make more fuel efficient cars] has been there forever. [Automobile manufacturers] are making money off the gasoline we burn." A man from Los Angeles expressed a similar view. "They [auto makers] could make cars more fuel efficient," he said, "but they just don't want to." Another man blamed the oil companies. "Who's throat are we cutting if we get 50 miles per gallon as opposed to 10? We're cutting the oil people. The oil companies are really controlling a lot of what we're doing [in terms of] fuel efficiency. We could create [better] fuel efficiency, but we have a lot of people who really don't want that to happen." Our findings are also consistent with results from the Union of Concerned Scientists survey which found that 54 percent "strongly agree" that U.S. automobile makers have the technology to make cars averaging 45 miles per gallon well before the year 2000. (See Table 25.)

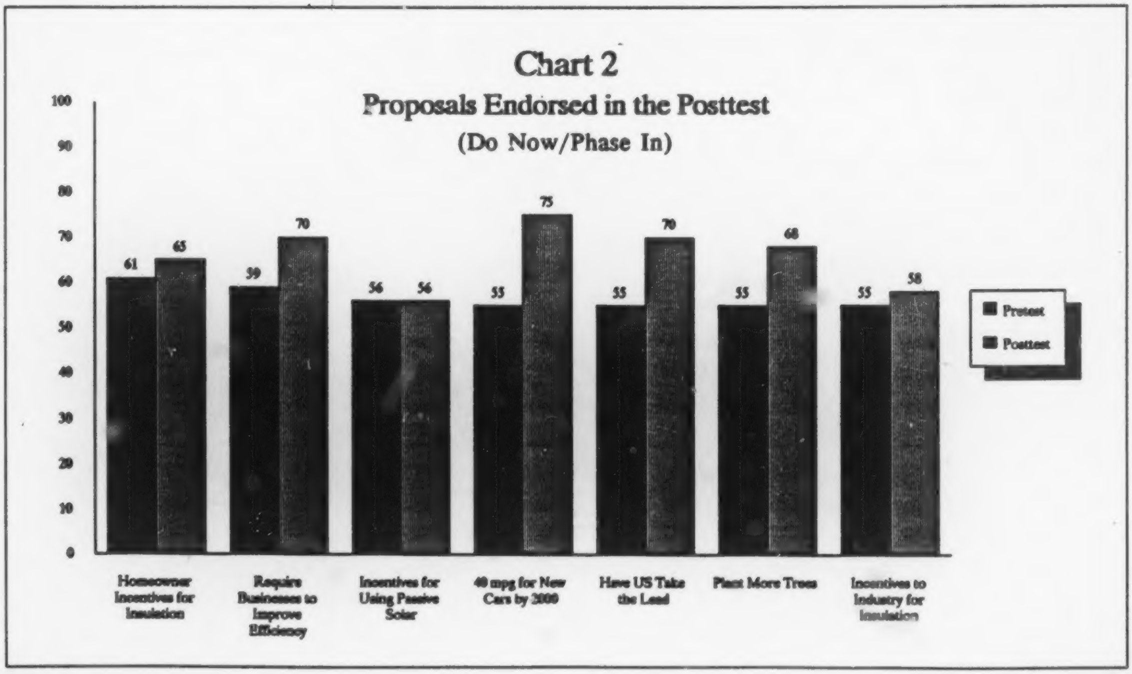

Chart 2
Proposals Endorsed in the Posttest
(Do Now/Phase In)

But not everyone who favored the proposal shared this view. Some panel members were in favor in spite of their feeling that mileage requirements would be costly. A Chicago area man said, "The price of a [new] car is going to go up anyway. What's the average price now -- eleven or twelve thousand dollars? The price is going to go up anyway, so if [making cars more fuel efficient] needs to be done, let's do it." A man from the Los Angeles area said, "I think [improved efficiency] would be worth the cost increase."

But not everyone favored increasing the mpg requirements. A Los Angeles area woman said, "The costs affecting us would be tremendous. The research and development going into producing these cars is going to come back to the consumer, and consumers are complaining about prices now. [U.S. auto makers] couldn't produce these cars at the same cost." A Nashville area man said the trade-off would involve more than price, arguing that such requirements would effectively limit the number of full-size cars that could be manufactured and that these vehicles are what American auto manufacturers specialize in. "You're going to put a lot of [auto factory workers] out of work by doing this [imposing mileage requirements on auto manufacturers]," he said.

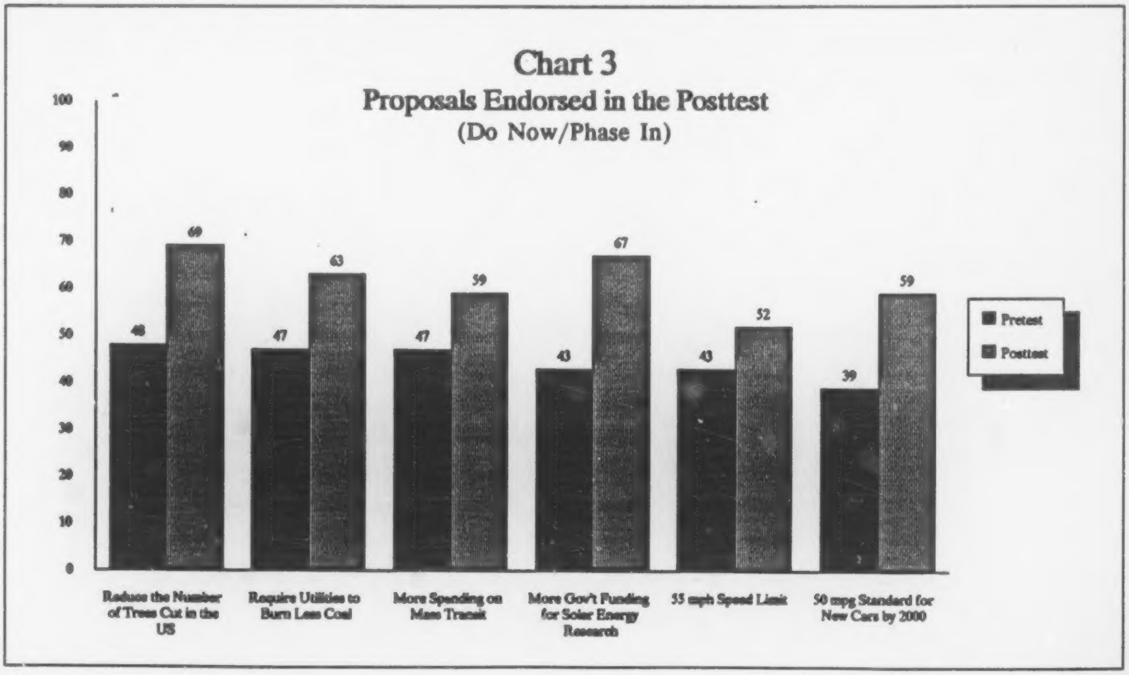
Chart 3
Proposals Endorsed in the Posttest
(Do Now/Phase In)

Another popular transportation-related proposal was to sharply increase federal spending for mass transit. Almost six in ten, 59 percent in the posttest, wanted to decrease our reliance on the automobile and spend more on mass transit in urban areas "even if that would mean a tax increase of about $50 per year per taxpayer."[15] The group was split over whether to increase such spending immediately (33 percent) or gradually, over the next decade or so (26 percent). Other data suggest that support for this proposal may grow; mass transit was most popular among college graduates (68 percent) and those in families earning over $50,000 a year (75 percent), two groups that are often precursors of widespread shifts in public opinion. (See Tables 24, 26, and 27.)

A number of respondents liked this proposal because they felt that mass transit would help with both greenhouse gas emissions and other auto-related problems such as smog. A man from the Nashville area said, "I think mass transit would be a partial answer. In California there is an electric train (Bay Area Rapid Transit) that runs all the time. There are thousands of people that ride it. And those people aren't driving their cars." In Los Angeles, where smog and traffic congestion may be the worst in the nation, a number of respondents pointed out the added benefits of reducing auto emissions. "I think it would be worth the cost [of implementing a mass transit system] to not have to breathe the fumes and sit and traffic all day," one man said. A woman from that area said, "These [mass transit] systems are run with more fuel efficiency, with more concern for the environment. There should be more of these." Others felt that making improvements in mass transit would make it more popular. "The reason everybody drives so much," a Nashville area man said, "is because there's no good alternative to driving now. We should work on public transportation."

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> *--Nashville Man*

A few respondents said that their local systems used to be better than they are now and that, from a historical point of view, mass transit has been contrary to the interests of certain powerful industries. "Southern California used to have a halfway decent public transportation system -- the Red Car," one man said. "And then they did away with it because of the automobile manufacturers and the oil companies." A man from the Hartford area said, "Prior to World War II, you had the best transit system in the area right here. Then the auto interests and the rubber companies wanted to sell cars so [the government, responding to industry pressure,] ripped up all the tracks."

Finally, a narrow majority, 52 percent, favored returning to a nationwide 55 miles-per-hour speed limit that would be strictly enforced, even if this would inconvenience truckers and drivers, especially in the western states. Of those in favor, most (37 percent) wanted to enact the measure immediately while a smaller number (15 percent) wanted to phase it in over the next ten years. During the discussion, however, a number of people suggested that this proposal was not practical, arguing that most Americans will not drive at 55 mph, no matter what the law and no matter how serious the threat of global warming. Others questioned whether driving 55 mph would substantially improve gasoline mileage and thus reduce greenhouse gas emissions. Support for this measure also varied from site to site. In Hartford, 61 percent were in favor, with 53 percent calling for immediate implementation. But in Los Angeles, where cars must be relied on, only a minority, 41 percent, wanted to return to a 55 mph speed limit that would be strictly enforced. (See Tables 24 and 28.)

In summary, respondents supported these four automobile-related proposals primarily for three reasons. They saw them as options that would:

- Reduce emissions contributing to the buildup of greenhouse gases;
- Concurrently help with other problems such as smog and, in the case of mass transit, traffic congestion; and
- Reduce greenhouse gas emissions and air pollution without being an excessive burden on taxpayers, consumers, or auto manufacturers (who, many thought, could absorb the cost of increase gasoline mileage if they were required to).

2. In the posttest, respondents favored two measures to improve energy efficiency in the home.

The film explained that the way people heat and cool their homes contributes to the buildup of greenhouse gases in two ways: through the burning of home heating oil and gas, and through the use of electricity. Since utility companies burn coal and oil to generate the electricity they sell to residences, the film continued, we could reduce greenhouse gas emissions by reducing home consumption of electricity. But respondents were asked to keep in mind that, as with every proposal, these measures too would either be inconvenient or costly.

Even in the pretest, the panel favored providing tax incentives to homeowners who increased the insulation in their homes. In the pretest, 61 percent favored this measure and in the posttest, 65 percent were in favor. Some understood the connection clearly. "Common sense tells you if you insulate your home, you're not going to use as much air conditioning or as much heat. If you're not using as much heat or air conditioning, you're not causing the electric companies to make that energy, so there's less [greenhouse gas] emissions put into the air," said a Nashville area man. (See Table 29.)

However, for many respondents the additional benefit of saving money on each electric bill seemed to be the most important reason to support this measure. A woman from the Chicago area said, "You're helping yourself out [by lowering your electric bills], but you are also helping your country [by indirectly emitting fewer greenhouse gases]." A woman from that area said, "Our house has insulation, and I have never had an electric bill over $100, so I am a big believer in insulation."

"You're helping yourself out [by lowering your electric bills], but you are also helping your country [by indirectly emitting fewer greenhouse gases]."
--Chicago Woman

Others questioned the equity of such incentives. A Hartford area man said, "This [proposal] would be very unfair for low income families who can't afford the insulation at the start." A Nashville area man said, "What about all the people who can't afford a home?" A woman from that area said, "The poor people would really lose out on this one." A man from Los Angeles raised a related issue, saying he would support such incentives only if they were retroactive. "Our home burnt to the ground," he said. "When we rebuilt, we put in almost double the insulation the city required, so we are thoroughly insulated. But we got no help from outside." A Nashville area woman made the same point. "What about the consumer who has already insulated his home? Will we give him the tax break too?"

Several people also questioned the extent to which this measure would address the problem. A Nashville area man said, "I don't think a tax break [for insulation] would produce a significant amount of energy savings. We have to have enough to affect the [volume of] emissions that TVA or whoever is dumping into the upper atmosphere. It's going to take probably everybody insulating their homes and putting up storm windows, not just a few people who say: 'Gee, I need a tax break this year.' "

"I would like to see all the new homes being built in this country to be energy efficient and use passive solar energy for heating and cooling."
--Los Angeles Woman

Finally, we should mention that several respondents noted that this was not a new idea and that similar tax credits had been offered in response to the "energy crisis." Indeed, as we discussed above, there was a good deal of confusion about the buildup of greenhouse gases and its relationship to the energy crisis as well as to other air quality concerns.

A second measure involving energy efficiency in the home was supported in both the pretest and posttest. Before and after the intervention, 56 percent favored offering tax incentives to builders who construct homes and offices to take advantage of passive solar energy. A Los Angeles woman said, "I would like to see all the new homes being built in this country to be energy efficient and use passive solar energy for heating and cooling." A Nashville area man said, "It [increased efficiency] has to start somewhere and if you're going to start anywhere, you have to start with the people who are building the homes." (See Table 29.)

However, this measure was not supported unanimously, again partly because of concern about equity. A Nashville man said, "Who is buying the new homes? The rich people! Who's living in the old homes? The poor people! Who's going to get the tax breaks? The rich people! Who's going to have to pay the difference? The poor people!" Others questioned whether the benefits would be passed along. A Chicago area man said that even with such incentives, "People would wind up taking a beating. [The builder] would charge $50,000 more because his home is more energy efficient than any of those other ones."

"Who is buying the new homes? The rich people! Who's living in the old homes? The poor people! Who's going to get the tax breaks? The rich people! Who's going to have to pay the difference? The poor people!"
--Nashville Man

In sum, respondents favored measures to increase energy efficiency in the home for three reasons. The group thought they would:

- Help homeowners save money on their heating bills;
- Reduce our use of energy (and thus our dependence on foreign oil); and
- Help reduce greenhouse gas emissions.

3. Majorities favored requiring utilities to burn less coal, and also favored two measures designed to decrease businesses' use of energy: tax incentives and requirements to increase fuel efficiency.

The film explained that another way we could reduce greenhouse gas emissions is by changing the way utility companies generate power. After the intervention, 63 percent wanted to require utilities to burn less coal either by using alternative fuels or by increasing energy efficiency, even if that meant that "many coal miners would lose their jobs." A man from the Nashville area expressed the thoughts of many when he said, "I think the needs of the many outweigh the needs of the few. And the coal miners would just have to change their jobs." A man from the area said, "I think it would be a good thing to get away from oil and switch to natural gas. I think there are incredible reserves of natural gas in this country." Importantly, however, and almost certainly because they were aware of the dislocations that would be involved, most wanted to phase in this measure (43 percent), not implement it immediately (20 percent). (See Table 30.)

Two proposals designed to reduce businesses' use of energy and thereby reduce greenhouse gas emissions were endorsed in both the pretest and posttest. The more popular proposal, to require businesses to improve fuel efficiency "even if that would greatly increase their costs and the price of their products," was supported by 59 percent in the pretest and 70 percent in the posttest, an 11 point increase. A proposal to encourage industries to increase efficiency even if that meant "giving them large tax breaks" was supported by 55 percent in the pretest and 58 percent in the posttest. (See Table 30.)

The idea of requiring businesses to increase fuel efficiency struck a responsive chord with many respondents. A woman from the Nashville area said, "They [business and industry] should be required to increase fuel efficiency. It's their environment too. They should be made to do it." As was true with the proposal to require auto makers to increase gasoline mileage, many felt that business and industry could take such steps at little cost. The breadth of this is suggested by one question; even in the posttest, the panel agreed, by a margin of nearly three to one (64 to 22 percent), that most pollution and other emissions contributing to the greenhouse effect could "easily" be eliminated if only "most businesses and industries were willing to take a small cut in profits." (See Table 31.)

However, support for imposing such requirements was sometimes conditional. Several raised the issue of fairness to U.S. firms, with a man from Hartford saying, "American businesses can't do it all. [The sacrifice] is going to have to be shared internationally." A man from the Nashville area expressed a similar view. "Even if we implemented all these [efficiency requirements]," he said, "it's only in this country. You can't tell France or England or Brazil what to do." And some opposed requirements on this basis. A man from the Hartford area said, "They are competing in a global market and if you require business to create a higher cost, you're going to weaken the economy even further."

"They are competing in a global market and if you require business to create a higher cost, you're going to weaken the economy even further."
--Hartford Man

Those favoring tax incentives said this approach would be easier to implement. A man from Nashville said, "If you require [a company] to do something, then there has to be a punishment like a fine [if it doesn't comply]. But you can't get money from a company that doesn't have any. If a company is near broke, you can't get anything out of them. You're just going to run them out of business. So it seems to me the way you get them to reduce emissions is through tax breaks. That would give them a motivation to do the right thing." Another Nashville area man reached the same conclusion for a different reason. "It's easier to deal with businesses than with people in their homes," he said. "There are fewer businesses than there are homes. [Businesses] are cost conscious, they're always looking for a tax break. It would be a lot easier to implement [tax incentives] with businesses than with homes."

However, a number of panel members voiced strong opposition to tax incentives. A woman from the Nashville area said, "Why should we have to pay for their tax breaks?" A man from Los Angeles said, "Those guys have enough tax breaks as it is without us giving them more?" A man from the Chicago area expressed a commonly held view. "The average company will [increase energy efficiency] on its own," he said. "They want to be more fuel efficient so they won't have to spend as much. Why should we give them a tax break if they want to do it on their own?" Finally, several panel members said that since businesses would merely "pass on" any additional costs to consumers, the question of whether to use requirements or tax incentives was largely academic.

In sum, the panel favored phasing in a requirement that utilities burn less coal because they felt that:

- A loss of jobs among coal miners was not too high a price; and
- There are abundant supplies of cleaner burning natural gas and conversion would not be too difficult or expensive.

They wanted to require businesses and industry to improve energy efficiency because they thought that:

- Such requirements would be fair to taxpayers and consumers; and
- Businesses could afford to implement the requirements.

They wanted to provide tax incentives to businesses and industry to increase energy efficiency because they felt that:

- Tax incentives would be easy to implement; and
- Tax incentives would be less onerous for businesses than the cost of requirements.

Finally, they favored all three measures because they would:

- Reduce energy consumption; and
- Reduce greenhouse gas emissions.

4. A posttest majority wanted to sharply increase government funding for solar energy research and development.

The film discussed several alternative energy sources that do not give off any greenhouse gases including solar energy using photovoltaic cells. The film explained that on one hand, solar energy creates no pollution of any kind; however, it continued, most scientists agree that solar energy will not produce energy at competitive prices for at least the next ten to twenty years no matter how much the government invests in solar energy research and development. After twenty years, respondents were told, scientists were not sure whether active solar energy would be competitive or how much energy solar power could realistically provide for the United States.[16]

In the posttest, two-thirds of the panel, 67 percent, wanted to increase government funding to spur the development of solar energy even if "many scientists doubt it will be a viable alternative in the foreseeable future." Support was across the board, regardless of education or family income. In the discussion, many respondents praised solar energy as the way to create energy without damaging the environment or endangering public health. A Nashville area man said, "Solar energy is clean, it answers all the questions about waste. Why not try it? It's the one [alternative] that doesn't have any residual bad effects." A man from Hartford made a similar point. "I think solar energy is definitely a thing of the future," he said. "It's unfortunate that the government hasn't put a hundred times more money into research than they have because it is nonpolluting, there is no fallout from it, no waste." (See Table 32.)

"We may not see an immediate [return] in the next ten years, but maybe in twenty-five to fifty years, our efforts toward [developing] solar energy will be realized and we'll be glad we did it."
--Los Angeles Woman

In the discussion, the moderators stressed that scientists were doubtful that solar energy could produce much energy in the short term, no matter how much the government invested. But large numbers of respondents said they would take the risk and increase investment anyway. A woman from the Los Angeles area disregarded the short-term expense. "We may not see an immediate [return] in the next ten years, but maybe in twenty-five to fifty years, our efforts toward [developing] solar energy will be realized and we'll be glad we did it." A man from that area related the issue to one that was familiar, saying, "The first VCR was expensive. But look at them now!" Others acknowledged that even though solar energy would be more expensive, they were in favor nonetheless. A man from Nashville said, "Solar energy is going to be expensive, but it's a [renewable] source. It's expensive but so is everything else."

When considering a variety of alternative sources of energy that do not give off greenhouse gases, a Los Angeles area woman compared solar energy to nuclear power. "I think solar has a lot fewer problems than nuclear energy does," she said. "And I think it is worth the effort to see what will happen in twenty years." A woman from Nashville echoed this view. "I'd rather put money into solar research than try to figure out a safe way to run a nuclear power plant," she said. "You know nothing bad can happen with solar energy. There's no waste product." (A complete discussion of the panel's views on nuclear power can be found later in this report.)

As with automobile fuel efficiency and other specifics related to greenhouse gas emissions, a large number of respondents argued that powerful economic interests such as the oil companies have deliberately blocked solar energy development to "protect their profits." A man from the Los Angeles area said, "The reason why solar energy is not going to help us in the next ten to twenty years is because they [the big oil companies] don't want it to be." A Chicago area man said, "They [business and industry] have the technology so we could use solar energy to make a whole city like Chicago work on that. What's happening is that politics are involved, big oil companies are blocking the further study of solar energy. We have Amoco and Standard Oil who say: 'Don't put money into that!' "

The group was given two possible explanations for why we don't have more solar energy today and 49 percent, up from 35 percent in the pretest, agreed that "Solar energy is simply too expensive, given our present technology." However even in the posttest, a large minority, 41 percent, agreed that "the big oil companies are trying to block the development of solar energy in order to protect their profits." Interestingly, these percentages were not significantly different among those with more education or income. For example, those with a college degree agreed to almost the same extent as did those with a high school diploma or less. (See Table 33.)

Still, there were a number of respondents who doubted that solar energy would be a good investment. A Nashville area man said, "I just don't think that enough can be gained. You can have a football field

"I just don't think that enough can be gained. You can have a football field full of solar panels and not generate enough electricity to wind your watch. I don't think [solar energy] is efficient."
--Nashville Man

full of solar panels and not generate enough electricity to wind your watch. I don't think [solar energy] is efficient." One man who had installed a solar hot water heating system in his home complained that it was both expensive and unreliable. A woman from Chicago also suggested that solar energy might not be a reliable source. "I have a solar calculator," she said, "and it doesn't work anymore." Finally, some wanted to continue solar energy research, but on a smaller scale. A man from the Chicago area said, "I don't think it is worthwhile putting money into (solar energy research) on the utilities scale, but on the individual homes to install a system, as a backup system to the regular furnace or air-conditioning system, that's the way I think we ought to go."

In sum, respondents wanted to invest in solar energy because they thought:

- An increased use of solar energy is inevitable and so we might as well develop the technology as soon as possible;
- Solar power is environmentally safe; and
- Current use of solar energy is low because research had been blocked by special interests and therefore a breakthrough might be easier than anticipated.

5. In the posttest, the panel also favored planting many new trees and reducing the number of trees that can be cut down in the U.S. each year.

The film discussed how trees, through the process of photosynthesis, absorb carbon dioxide and give off oxygen, thereby reducing the concentration of carbon dioxide in the atmosphere. Three of the proposals to deal with greenhouse gas emissions involved trees: curbing deforestation, especially in South American and Africa; reducing the number of trees that can be cut down in the U.S. each year; and requiring communities to plant a large number of new trees.

In the posttest, 69 percent, up from 48 percent in the pretest, wanted to reduce the number of trees that can be cut down in the U.S., even if this would increase the price of paper products and might even put some logging companies out of business. Some respondents talked about the problem of clear cutting. A woman from Chicago said, "Out west they're cutting down trees all over the place and not replanting them. Other guys will come in and cut down a whole forest and just leave it." A man from that city expressed frustration at having to consider such a costly option that also was a direct contradiction of recent government policy. "Last year our country wouldn't put out a fire in a national park," he said. "Thousands and thousands of acres burned up." Finally, almost no one mentioned the added cost to consumers that this measure would require. (See Table 34.)

Another popular measure was to require communities to plant a large number of new trees even at a cost of $50 per year to each taxpayer. In the posttest, 68 percent favored this proposal compared to 55 percent in the pretest, a 13 point gain. Some respondents said this idea had benefits beyond the greenhouse effect. A Chicago area woman said that by planting more trees, "You'd be taking care of two things: you'd be putting beauty back into your cities and helping the greenhouse effect somewhat." In addition to aesthetics, some respondents suggested that the shade provided by new trees might lead to a reduction in the overall demand for air-conditioning. (See Table 34.)

> ***"Last year our country wouldn't put out a fire in a national park. Thousands and thousands of acres burned up."***
> *--Chicago Man*

"Even if we can't plant enough trees to cover half of the United States, at least we can do a percentage that's going to help [reduce carbon dioxide levels]. We have to do something."
--Los Angeles Man

During the intervention, respondents were told that scientists who have studied the greenhouse effect say that in order to absorb the amount of carbon dioxide released into the atmosphere by human activity, it would be necessary to plant enough trees to cover an area half the size of the United States.[17] A woman from Nashville expressed a similar thought. "When you're talking about planting trees," she said, "I can't imagine how much one tree will help what is going on in the atmosphere." But a man from Los Angeles expressed a more common view. "Even if we can't plant enough trees to cover half of the United States," he said, "at least we can do a percentage that's going to help [reduce carbon dioxide levels]. We have to do something."

In sum, respondents supported planting more trees and reducing the number of trees that can be cut in the U.S. because they thought:

- Current practices such as clear cutting are destructive to the environment;
- They did not feel that the trade-offs in terms of logging industry jobs or the increased costs of paper products would be severe;
- Planting more trees would aesthetically improve the country; and
- These measures would reduce greenhouse gas emissions.

6. After respondents learned more about the greenhouse effect, a majority supported thirteen of the twenty-five proposals, with support in the posttest increasing by as much as 24 percentage points for some of them.

Respondents were asked identical questions in the pretest and posttest about 25 proposals to address possible global warming and in the posttest, thirteen proposals were endorsed by a majority. Nine of those thirteen received substantially more support after respondents learned more about the greenhouse effect, suggesting that as public awareness about this issue increases, support for certain kinds of proposals may increase more quickly and sharply.

Proposals (and trade-offs) where support increased by at least 20 percentage points include the following:

- More funding for solar energy research: $50 tax increase
  +24 points
- Reduce trees cut in U.S.: prices up, jobs lost
  +21 points
- 40 mpg by 2000: car prices up, poorer performance
  +20 points
- 50 mpg by 2000: prices up sharply, poorer performance
  +20 points

Proposals (and trade-offs) where support increased by at least 10 but less than 20 percentage points include the following:

- Utilities burn less coal: coal miners lose jobs
  +16 points
- U.S. take lead: Americans sacrifice more than others
  +15 points
- Plant more trees: $50 tax increase
  +13 points
- More spending on mass transit: $50 tax increase
  +12 points
- Businesses improve efficiency: they get tax breaks
  +11 points

It is interesting to note that three of these nine proposals involve a tax increase, another would give what were called "tax breaks" to business and industry, and two would raise automobile prices while decreasing performance. Two other proposals involved the loss of jobs (either for coal miners or those in the lumber industry), and one would mean that "American companies and citizens would have to make more sacrifices than people in other countries."

In sum then, looking at the nine proposals where support increased significantly suggests that the panel understood and accepted the fact that reducing greenhouse gases would mean sacrifices in terms of higher taxes, higher prices for certain products, and job loss, at least in certain industries. However as we discuss in the next section, there were a number of measures the panel did not endorse. (See Table 23 and Charts 2 and 3.)

Proposals That Were Rejected in Both the Pretest and Posttest

1. Twelve of the 25 proposals for addressing the greenhouse effect were rejected in the both the pretest and the posttest. But of those twelve, four proposals were endorsed by a large minority.

Almost half of the proposals for dealing with the greenhouse effect were rejected by a majority of the panel, even after the group learned more about the issue. As we discuss at length below, the most unpopular proposals involved raising the gasoline tax or rationing gasoline, or taxing the use of home heating oil. (See Table 35 and Charts 4 and 5.)

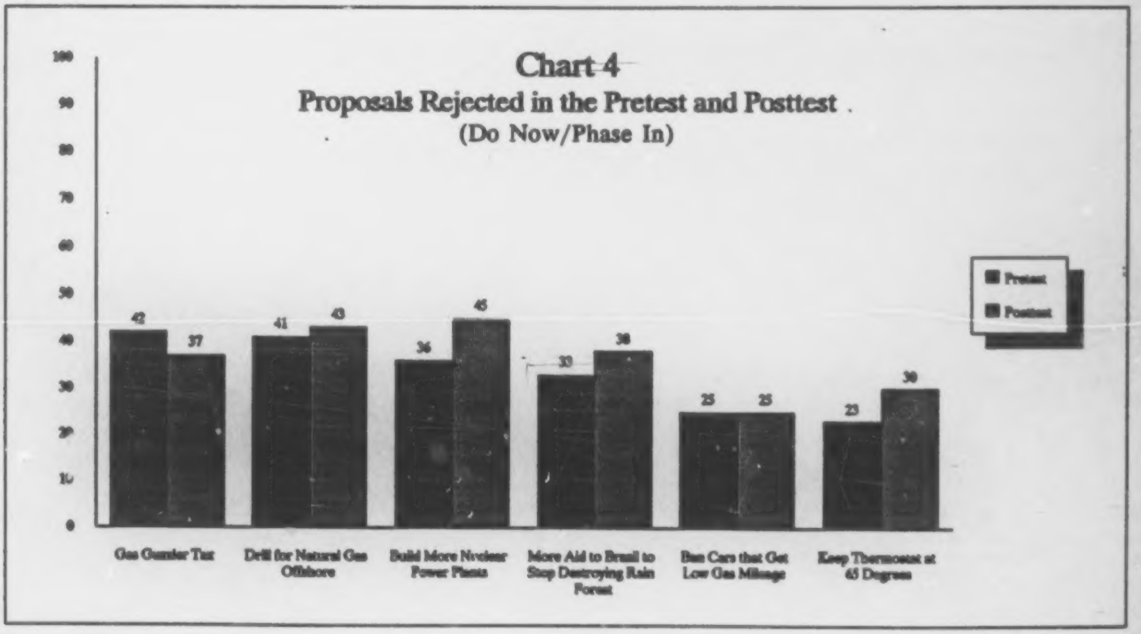


Chart 4

Proposals Rejected in the Pretest and Posttest

(Do Now/Phase In)

Four of the rejected proposals received support from a sizable minority. About four in ten endorsed:

- building more nuclear power plants,
- drilling offshore for natural gas,
- taxing gas guzzlers, and
- giving more aid to Brazil if they stop destroying the rain forest. (See Table 35.)

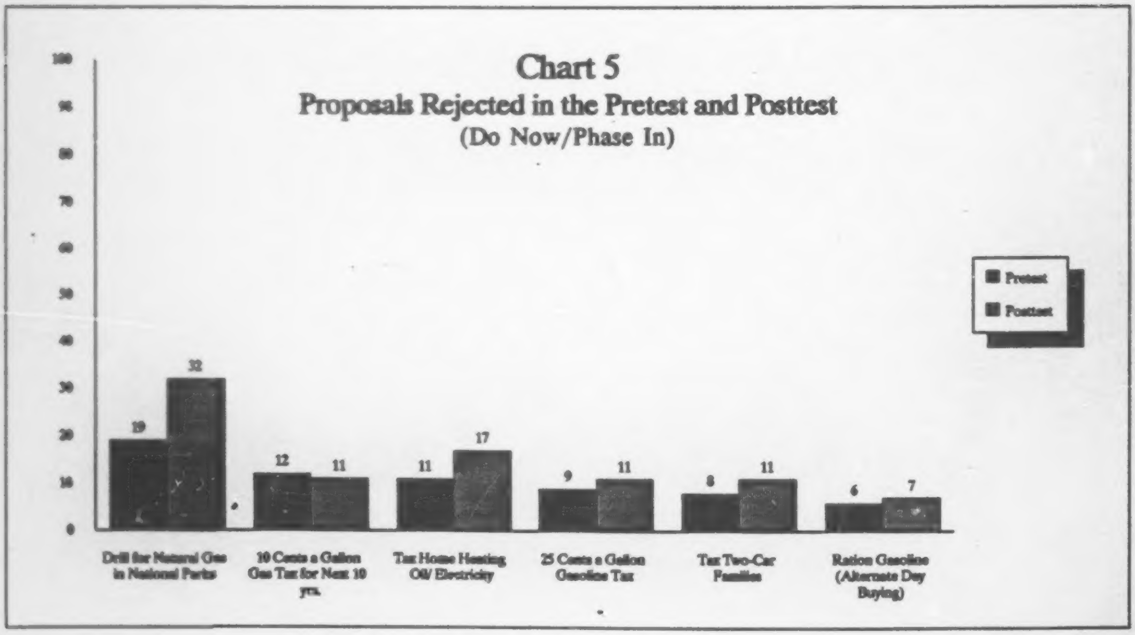


Chart 5

Proposals Rejected in the Pretest and Posttest

(Do Now/Phase In)

2. Opposition to building more nuclear power plants did not decrease after the panel learned about possible global warming and that, unlike fossil fuels, nuclear power generates no greenhouse gas emissions.

Some of the country's most farsighted policy makers argue that, especially in view of the threat of global warming, the U.S. may be forced to rethink its policy on nuclear power and increasingly look to fission reactors to provide more of the country's energy into the early part of the next century.[18] Indeed, as we discuss at length later in this section, the leading scientists surveyed also favored a sharp increase in U.S. reliance on nuclear power, with 68 percent saying we should build more nuclear power plants. Some observers even predict that public opinion about nuclear power, which has been polarized since the accidents at Three Mile Island and Chernobyl, will of necessity shift in favor of the technology as Americans come to understand the gravity of threatened global warming and the lack of alternatives to fossil fuel. (See Table 67.)

In both the pretest and posttest, respondents were asked if they favored building "more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect) even if that means living with the risks posed by that technology." In the pretest, only 36 percent were in favor, and 45 percent were opposed. These results are consistent with the results of a recent national survey conducted for the Union of Concerned Scientists in which 33 percent favored and 45 percent strongly opposed building more nuclear power plants. (See Tables 36 and 37.)

In the intervention, respondents were told about the benefits and risks of nuclear power. For example, in the film the narrator said that one alternative to oil and coal is to use more nuclear power:

> Nuclear power does not produce any greenhouse gas emissions or air pollutants of any kind. And nuclear power is widely and safely used in many other countries. Right now, nuclear power provides about 10 percent of our energy. [But] opponents of using more nuclear power argue that, though it is clean burning, nuclear

power creates more problems than it solves. In addition to the risk of a catastrophe such as the accidents at Chernobyl or Three Mile Island, they argue that we still don't know how to safely dispose of the radioactive wastes produced by nuclear power plants.

"It [nuclear power] won't add anything to the greenhouse effect at all, and it does produce a considerable amount of energy."
--Nashville Man

In the discussions, the moderator reviewed these points to make sure that the group clearly understood that conventional nuclear power plants like the ones used in the U.S. and in many other countries around the world do not contribute at all to the buildup of greenhouse gases. But in the posttest, after learning about and discussing these issues, only 45 percent wanted to build more plants, with 20 percent saying we should build more plants immediately and 25 percent saying we should phase in more nuclear power plants over the next decade or so. While this does represent a nine percentage point increase in support, it is far below the 68 percent support level among the scientists. Additionally and perhaps more important, the number who opposed building more nuclear power plants did not decrease; in the pretest, 45 percent opposed building more nuclear power plants and in the posttest 46 percent continued to oppose nuclear power. (See Table 36.)

During the discussion, responses to nuclear power were mixed. Some said that in view of the threat of global warming, we had no choice but to look to nuclear power. A Nashville area man said, "It [nuclear power] won't add anything to the greenhouse effect at all, and it does produce a considerable amount of energy." Others who were in favor argued that using more nuclear power was inevitable and that it would be foolish not to build more. A man from Nashville said, "I sincerely think that by the year 2050 or 2075 or 2100, just about everything we run is going to be run by nuclear power of some kind or another. It's going to be used to generate all of our electricity and probably run our cars, and no telling what else."

A number of respondents felt that nuclear power had been unfairly condemned. A Nashville man said, "I think the risks involved in nuclear power are being greatly exaggerated by people who don't want them." A Chicago area man agreed, saying, "The way [opponents of nuclear power] look at [Three Mile Island], you'd think it was the end of the world. But apparently [nuclear power plants] are safe because if they weren't, we'd have a heck of a lot more [accidents like the one at

Three Mile Island]." Another man from Nashville said, "I think we have been programmed to look at nuclear power in an antagonistic way. Europe is using nuclear power and they are having no trouble."

Others favored more nuclear power, but with reservations. Some were critical of past management. A Nashville area man said, "I'm for nuclear power if you do it right!" Still others felt that technological improvements were necessary before we should rely on it too much. A man from the Chicago area said, "They [nuclear engineers and government regulators] don't have [nuclear power] down to a real safe thing yet, but they are working on it and I think in time they will get it."

However, those who opposed nuclear power often expressed fierce opposition. Some opposed nuclear power on practical grounds. "I haven't seen a single thing that nuclear power has done," said a man from the Hartford area, "except cost big bucks and raise our electricity bills." More frequently, respondents said that nuclear power plants are inherently unsafe and should not be relied on, no matter how serious the threat of global warming. A man from Chicago, referring to past accidents, said, "The more [nuclear power] we have, the more meltdowns we're going to have." Others such as a Hartford area man argued that while the likelihood of an accident might be small, the magnitude of the danger was overwhelming. "When they do have an accident [with a nuclear power plant]," he said, "the places where the accident happened are no good for centuries." A woman from Chicago agreed, calling nuclear power plants "a time bomb" and saying, "It may not ever happen, but if it does, it'll be twenty times worse than anything else." Some felt that nuclear power was more unsafe than the public had been led to believe and that the U.S. government and other governments had misled the public in the past. A Los Angeles man said, "The Russians haven't told us [the whole truth] about Chernobyl."

But most of the opposition to nuclear power focussed on the safe disposal of the radioactive waste. Again and again respondents questioned the wisdom of building more plants without a solution to this problem. A Los Angeles woman said, "What about nuclear waste? They haven't got any place to dispose of it. It's not safe to put anywhere." A man from Hartford said, "The worst drawback to nuclear power is the waste. We don't know how to take care of it." In Nashville a woman asked, "What are you going to do with all of the radioactive waste?" And a Chicago area man said, "The toxins in nuclear

> ***"I haven't seen a single thing that nuclear power has done except cost big bucks and raise our electricity bills."***
> *--Hartford Man*

power plants have a half-life of something like 2,000 years where you can't go near them. What are you going to do with that? Put it out in space?"

"What about nuclear waste? They haven't got any place to dispose of it. It's not safe to put anywhere."
--Los Angeles Woman

There was so much talk about the disposal of radioactive waste that we are uncertain about the extent to which those whose opposition was based on waste also believed that nuclear power is inherently unsafe. That is, the discussion suggests that if the waste issue were solved, support for using nuclear power might increase, perhaps even increase significantly. But our results also suggest that learning about the greenhouse effect will not change the thinking of those who oppose nuclear power; for those who are already opposed, no amount of information or persuasion is likely to change their minds. Indeed, nearly one in three, 31 percent, said we should not build more nuclear power plants even if new evidence suggests that global warming caused by the greenhouse effect will have "catastrophic effects" by the middle of the 21st century. (See Table 36.)

In sum, respondents opposed using more nuclear power because of:

- Concern about the safe disposal of radioactive wastes;
- Concern about the catastrophic effects of an accident;
- Concern about the management of nuclear power plants; and
- Concern about the costs of nuclear power.

3. Respondents rejected the idea of increased drilling for natural gas in the national parks or offshore, although the latter was acceptable to a large minority.

The film explained how using more natural gas would reduce greenhouse gas emissions. "While underground natural gas does give off some greenhouse gases," the narrator said, "it produces fewer greenhouse gas emissions per unit of energy than coal and oil." In the discussions, the moderators also explained this point. The questionnaires asked respondents about drilling for natural gas in light of two trade-offs related to the environment: whether we should drill in our national parks or off the coast of California and the east coast, among other places.[19]

While both proposals were rejected by a majority, both were acceptable to large minorities, especially after the intervention. For example, in the pretest, 41 percent favored more offshore drilling compared to 43 percent in the posttest, an increase of two points. However, the number in favor was somewhat lower in Los Angeles, the site nearest where such drilling might occur. In the posttest, 36 percent of the Los Angeles were in favor of more offshore drilling while 60 percent were opposed. (See Table 39.)

In the pretest, only 19 percent of the panel favored increased drilling for natural gas in our national parks. However, in the posttest, 32 percent were in favor, a 13 percentage point increase. Most of those in favor thought that natural gas was a cleaner source of energy and that increased drilling was worth the risks. A man from Los Angeles said, "I think [natural gas] is a good idea. The more we can do [to reduce greenhouse gas emissions] even a little bit will help." But even after the intervention, most were opposed to these proposals, with 50 percent opposing offshore drilling and 61 percent opposed to drilling in the national parks. (See Table 38.)

Environmental concerns were, of course, the basis for opposition. Some respondents referred to particular accidents like the Exxon Valdez oil spill in 1989 and the potential for devastation. A man from Chicago said, "I wouldn't have any problem drilling in our wilderness, as long as they could not damage the environment. But our oil compa-

"We've screwed up our environment so badly already, why go any further?"
--Los Angeles Man

nies have a very poor record." Others talked about the effects of drilling even when there is no accident. Another Chicago area man said, "When the companies [drill off the coast], they destroy the area ecologically," he said. "The fishing industry is shot to hell. Everything else that relies on the coast itself, like the shrimp, are destroyed when they go in there and start drilling for natural gas." Still others were concerned in the most general sense. A man from Los Angeles said, "We've screwed up our environment so badly already, why go any further?"

In sum, though sizable minorities were in favor, more respondents opposed increased drilling for natural gas because of their:

- Concern about the environmental effects of an accident; and
- Concern about damaging the environment in a general sense.

4. Most respondents also rejected two proposals to limit the number of "gas guzzlers," cars that get poor gas mileage; in fact, a gas guzzler tax was less popular after the intervention.

Respondents were asked if they would support a tax on "gas guzzlers" to discourage people from buying cars that get poor gas mileage and thereby give off more greenhouse gases. This measure was the only one of the twenty-five less popular in the posttest than in the pretest. Initially, 42 percent were in favor compared to only 37 percent in the posttest, a five point decline. Opposition increased by ten percentage points, to 60 percent in the posttest, with most of those opposed (a total of 40 percent overall) saying they would not change their minds no matter how catastrophic global warming might become. (See Table 40.)

Most of those who rejected the gas guzzler tax did so because they thought it would be unfair to people who need a full-size car, including people with large families, big or tall drivers, and those who need large cars for their work. A woman from Nashville said, "You can't have more than two kids if all you're going to have is this little compact [car]." A man added, "I have four kids so I have a big car. That's why my car's a gas guzzler." Another man from the Nashville area said, "There are going to have to be large cars; there are large people." A woman from Los Angeles pointed out that such a tax would be unfair to those who need a large car for business. "What if it is a person who owns a business and needs a van for the extra space? You are penalizing that person because he or she needs extra space. A painter or a handyman or a carpenter certainly can't carry things around in the back of a hatchback." Another Los Angeles area woman said, "There are reasons why people drive big cars. Large families, the handicapped, and some people just like the comfort of a big car."

Other respondents felt that it was unfair to place most of the burden of dealing with greenhouse gas emissions on certain kinds of drivers, rather than on everyone equally. A man from Chicago said, "I don't think we should put the burden on one group of people by taxing gas guzzlers. I think [the greenhouse effect] is everybody's problem." A woman from Los Angeles said, "I think it is undemocratic to penalize some people. Don't just single them out."

"I have four kids so I have a big car. That's why my car's a gas guzzler."
--Nashville Man

Some respondents also argued that a gas guzzler tax would not be effective, saying that consumers would simply pay the increased price. A man from Chicago suggested that past experience showed how little effect such taxes have, saying that whenever a tax is put on a popular product, "It hasn't discouraged anybody. It is another ineffective tax. It won't work." Others agreed, saying that people who want or need large cars would simply pay the additional cost. It should be noted that past experience has shown that taxes do change behavior, and therefore the argument that a tax would be ineffective may be seen as a rationalization.

Respondents also opposed the idea of banning cars that get low gas mileage. While 25 percent supported this proposal in the posttest, opposition to the idea increased by eight points to 70 percent. As with a tax on gas guzzlers, many felt that those who need a large car should not be singled out. An all out ban on these cars was even more unpopular than a tax because it would not punish people for driving such cars, but prevent them from doing so. (See Table 40.)

In sum, these two proposals were unpopular for two reasons. Respondents thought:

- They would be unfair to people who need a large car, including people with large families, big or tall drivers, and those who need a large car for work; and
- They would be ineffective.

5. While most respondents rejected giving more aid to countries that stop destroying the rain forest, nearly four in ten were in favor in the posttest.

Respondents were asked whether or not they supported giving more aid to Brazil if it stops destroying the rain forests, "even if this means increasing foreign aid and cutting spending in other areas." In the film respondents were told more about the reasoning behind this proposal.

> Developing countries in South America and Africa are destroying huge areas of rain forest as they try to develop their economies and improve their standard of living. Advocates of this approach say we should encourage these countries to stop the destruction by providing technical assistance and other help so that they can develop their economies without destroying the rain forests. But opponents argue that encouraging these countries not to destroy their forest would require an increase in foreign aid which would amount to a costly "bribe" that might have to be increased year after year.

In the pretest, 33 percent supported giving aid and in the posttest, 38 percent were in favor, a five point increase. But most panel members were opposed and nearly one in three, 32 percent, did not want to give such aid even if further evidence suggests that the greenhouse effect will have "catastrophic effects." (See Table 41.)

Given the unpopularity of foreign aid in a general sense, it is not surprising that this proposal was rejected. Some thought this proposal would not work because it would be hard to monitor or verify, or that, as the film argues, foreign countries may place higher and higher demands that the U.S. would be hard pressed to match. A woman from Hartford said, "I can't see giving more money to foreign countries. First, we can't control what they do, and second, it is going to be like extortion: [they say to us] 'Okay, we won't cut down another acre, give us another thousand dollars.' " A Los Angeles area woman said if in return for not cutting the rain forest, "You offer people money and they're gradually going to increase the amount they want." Some also worried that the money would not be used for its intended purposes.

"I can't see giving more money to foreign countries. First, we can't control what they do, and second, it is going to be like extortion: [they say to us] 'Okay, we won't cut down another acre, give us another thousand dollars.' "
--Hartford Woman

"If we have any extra money, let's put it right here in the United States, let's get our act cleaned up first."
--Los Angeles Man

A number of people felt that even versus a global problem, domestic spending should be a higher priority. A Los Angeles area man said, "If we have any extra money, let's put it right here in the United States, let's get our act cleaned up first." A man from Hartford said, "Let's worry about here first and then start worrying about other places." To a few respondents the issue was not so much aid per se, but the notion of imposing our preferences on other countries when, it was argued, current government policy contributes to the problem. For example, a man from the Chicago area criticized the policy of letting forest fires in national parks burn themselves out, complaining that tens of thousands of acres had been destroyed and saying, "Now what good is criticizing some of the foreign nations [for destroying the rain forest]? I think we should take care of [our own contribution to the problem] first."

A number of respondents argued that instead of sending aid to Brazil, the U.S. should educate the Brazilians about the destructive effects of deforestation. A few held this view even after the moderator explained that the policy of deforestation is intended to promote economic development and increase Brazilians' standard of living, that the government is aware of the global environmental consequences of such actions, and that this is not an issue of educating the Brazilians about anything.

Finally, as noted, nearly four in ten did favor this proposal. A woman from the Chicago area said, "It [the greenhouse effect] is a global thing. I realize we have to take care of our country first, but we can help others too." A woman from that area said, "If we give aid to these countries in order for them to preserve the trees in the rain forest, I think that sounds good." And a few said that while they opposed giving money, they did not oppose giving aid. "Giving them money isn't the solution," said a man from the Los Angeles area. "Giving them what they need is the solution." (See Table 41.)

In sum, respondents opposed giving more aid to countries like Brazil if they stop deforestation for three reasons. They thought aid was:

- Too expensive, given the country's domestic needs;
- Unlikely to be used for the purpose intended; and
- Likely to turn into a "bribe" that would be increased regularly.

6. Two proposals that were soundly rejected involved changing the way we heat and cool our homes.

The group was told that people contribute to the problem of greenhouse gas emissions by using electricity from utilities that burn fossil fuels and by using heating oil and natural gas to heat their homes. To the extent that demand is cut, the narrator said, utilities would burn less fuel and thus emit fewer greenhouse gases. The panel was asked to consider regulations and taxes designed to make homeowners and renters use less electricity and home heating oil.

In spite of some incremental increase in support, respondents dismissed both proposals. Only 30 percent wanted to require people to keep their thermostats at 65 degrees, even if exceptions were made for the elderly and the sick. While this represents a seven point increase from the pretest, a very large number, 43 percent, said this measure should not be enacted, no matter how bad the threat of global warming may become. Additionally, in the posttest only 17 percent wanted to discourage the use of heating oil, etc. by passing a tax that would increase heating costs for homeowners and renters. Again, while there was a slight (six point) increase in support for this proposal compared to the pretest, a large number, 43 percent, said they would oppose this measure no matter how catastrophic scientists thought global warming might become. (See Table 42.)

Many panel members thought that it would be impossible to enforce a requirement that people keep their thermostat at 65 degrees. A man from Chicago asked, "How would you monitor it anyway?" Others not only said it would be difficult to enforce but that this proposal would infringe on people's freedom. A woman from Chicago said, "Can you really regulate a household? I think that is a personal thing. I think you are really stepping on personal freedom when regulating what temperature your house is going to be. I remember having a newborn baby in the middle of winter and having my thermostat up because of that." A woman from the Nashville area said, "That is nobody's business what I put my temperature on in my house."

"Can you really regulate a household? I think that is a personal thing. I think you are really stepping on personal freedom when regulating what temperature your house is going to be. I remember having a newborn baby in the middle of winter and having my thermostat up because of that."

--Chicago Woman

"That is nobody's business what I put my temperature on in my house."
--Nashville Woman

Opposition to a tax on heating oil stemmed in part from a feeling that the measure would not work, that people would simply pay the higher prices. More importantly, however, and as we discuss in more detail below, the panel was reluctant to support a proposal that would increase the cost of what was considered to be a necessity -- a warm home. While the panel endorsed a number of proposals that would increase taxes, there was widespread opposition to taxing what the group considered to be necessities.

In sum, respondents opposed requiring people to keep the thermostat turned down to 65 degrees in the winter because they felt that:

- It would be impossible to enforce; and.
- It would infringe on people's rights.

The group opposed taxing home heating oil because they felt that:

- Higher taxes on heating oil would not discourage use; and
- Such taxes would amount to a tax on a necessity and, as such, difficult for many people to afford.

7. Four proposals, including two to raise the gasoline tax and two to otherwise discourage our use of the automobile, were soundly rejected, receiving support from only about one in ten.

The panel was asked to react to two proposals to raise the gasoline tax in order to discourage people from driving and thereby reduce the buildup of greenhouse gases. The first proposal involved a one-time, 25 cents per gallon tax, while the other called for an annual increase of 10 cents per gallon over each of the next ten years, totalling one dollar a gallon after a decade. Both were soundly rejected, receiving support from only 11 percent in the posttest; about two-thirds of the group said they would oppose both, even if evidence suggested that the effects of global warming would be catastrophic. A recent national survey conducted by Yankelovich, Clancy and Shulman for Time found a similar result; more than two-thirds, 77 percent, of a national cross section rejected a gasoline tax in order to "conserve more energy" while only 21 percent were in favor. (See Tables 43 and 44.)

Many argued that a gasoline tax would be ineffective, even though experience has proven this is not the case, suggesting that these comments were at least partly a rationalization. A man from Hartford said, "I don't think a higher gas tax is going to stop people from driving. I know it wouldn't stop me, and I don't have very much money." In group after group, respondents echoed this view. A woman from Nashville said, "When gas went up to $1.50 a gallon I was driving the same amount of miles as I did having to pay 88 cents." A Chicago area woman said, "I don't think [a gasoline tax] is going to deter people from using their own car. I used it just as much when [gasoline] was a buck and a half."

Some said a gas tax would be unfair. "It's going to put a lot of people at a disadvantage, especially the lower income people," said a man from Chicago. "It would also cause inflation." Others mentioned the burden on people who need their cars for work. A woman from Hartford said, "I don't think we should put a tax on gasoline because first of all, people won't stop driving, they'll just pay the tax; and second, because there are people who have to travel for their work, you're coming down on them and that would be unfair." Some cited what

"I don't think a higher gas tax is going to stop people from driving. I know it wouldn't stop me, and I don't have very much money."
--Hartford Man

"If you do raise gas prices, that is just going to raise the price of trains and trucking. A lot of people live in rural areas, and they can't afford to pay ridiculously high food prices."
--Chicago Woman

they felt were other inequities such as the increased cost of trucking. A woman from Chicago said, "If you do raise gas prices, that is just going to raise the price of trains and trucking. A lot of people live in rural areas, and they can't afford to pay ridiculously high food prices [that would result from higher transportation costs]."

To sum up, the main reason why the group opposed a gas tax was because they saw it as a proposal to tax what they see as a necessity. A gasoline tax would increase the price of something nearly everyone must use and rely on; driving is not something that the panel feels most people have a lot of discretion about or could easily cut back on. A Los Angeles woman summed up her opposition to any kind of gasoline tax by saying, "This is the wrong state to say that in."

Respondents also rejected the idea of discouraging two-car families by making families that buy a second car pay a steep tax. Only eight percent supported this proposal in the pretest, and only 11 percent in the posttest. This proposal was unpopular because, again, many felt it would not work and that it would be unfair to people who need two cars. (See Table 43.)

Some panel members argued that such a tax would even be counterproductive. One man gave an example of a couple who work at opposite ends of a town without much public transportation. With two cars, he argued, the couple would each go their own way. But with a single car, one would have to drop the other off, then drive to work, then drive back to pick the other up, then drive home, thereby effectively doubling the amount of miles driven per day. More frequently though, the idea of taxing a family who buys a second car was simply dismissed. To many, including those whose families have only one car, the idea of a second car was not considered to be a luxury in any sense but rather something many people need.

The most unpopular of the 25 proposals was the idea of gasoline rationing through alternate day-of-the-week buying. In spite of the fact that many states imposed just such a system in response to the oil embargoes in the 1970s and the fact that many have already been forced to tolerate this inconvenience, this proposal was supported by only seven percent in the posttest. In fact, a whopping 71 percent said they would oppose this measure, no matter how catastrophic scientists thought global warming might be. Respondents simply dismissed this measure as unnecessarily drastic. (See Table 43.)

In sum, respondents opposed these measures because they thought that:

- A gasoline tax would amount to a tax on a necessity, not something that people have much discretion about whether to use or not;
- A gasoline tax would be especially hard on low and middle income families, and those who need their car for work; and
- A gasoline tax would not be effective.

- A tax on two-car families would be unfair and would not work; and
- Rationing would be a serious hardship that was not necessary.

Scientists and the Public:

The Assessment of the Threat of Global Warming

1. While the 418 scientists surveyed were not sure whether global warming caused by the greenhouse effect has begun, most did not think global warming would be catastrophic, at least for the next half-century.

We asked the group of 418 leading scientists if they thought global warming caused by the greenhouse effect had already started. As a group, they expressed broad uncertainty, with 40 percent saying yes, 13 percent saying it has not started, and the largest segment, 47 percent, saying they were not sure whether global warming caused by the greenhouse effect has started or not.[illegible] We invited the scientists to comment on questionnaire items, and one of them suggested why so much uncertainty exists. "Measurements of global warming are inexact at best," that scientist wrote, "and cannot be distinguished from a natural warming trend." Another wrote, "The effects of [increased] cloud cover is a complete unknown." A third wrote, "There is no way of deciding this yet because the climate models are too primitive." And a number of them volunteered that they thought there should be a strong research effort in this area. (See Table 45.)

We also asked the scientists what global warming caused by the greenhouse effect would lead to and when. If present trends continue, we asked, when would global warming cause major environmental devastation: by the year 2000, 2050, or by 2100? Only six percent said global warming would cause devastation by the year 2000, and only 29 percent said it would cause devastation by 2050. However, 55 percent felt that the effects would be devastating by the year 2100. And in response to each of the three questions, very large numbers were not sure. For example, 52 percent said they were not sure what the effects would be by the year 2050. One scientists summed up the sentiments of many, writing, "Who knows?" (See Table 46.)

> ***"Measurements of global warming are inexact at best, and cannot be distinguished from a natural warming trend."***
> ***--Scientist***

Later in the questionnaire we asked the question again, this time in the same wording we gave to the panel. Given two alternatives about what might happen by the year 2050, only 10 percent of the scientists said that global warming would cause widespread environmental devastation, while 76 percent said it would more likely cause "slow, incremental change,"[21] and 14 percent were not sure. The scientists' assessment was notably close to the view of the panel; in the posttest, 62 percent of the panel thought that change would be slow and incremental while only 20 percent predicted devastation. (On another item, 34 percent of the scientists and 29 percent of the panel in the posttest agreed that "we should wait for more conclusive scientific evidence" before taking decisive action to deal with the threat of global warming.) These results, taken together, lead us to conclude that, at least in the posttest, both groups had a roughly equivalent idea about the magnitude of the problem, and that the solutions advocated by both groups were predicated on similar forecasts. (See Tables 47 and 48.)

"There is no way of deciding this yet because the climate models are too primitive."
--Scientist

2. The scientists, again like the panel, wanted the U.S. to assume world leadership and take decisive action to address the threat of global warming.

While most of the 418 leading scientists did not think that global warming caused by the greenhouse effect would be catastrophic, at least by the year 2050, 70 percent of them nevertheless wanted the U.S. to lead international efforts to address this threat "even if that means American companies and citizens have to make more sacrifices than people in other countries." One scientist wrote that while the U.S. should take the lead, it "should be accompanied by a push for cooperative action." Another wrote that the U.S. should take world leadership "only because we use an overwhelming portion of fossil fuel." (See Table 49.)

As noted earlier, the panel also felt that the U.S. should take the lead in international efforts to address the greenhouse effect, even if that meant U.S. citizens would have to sacrifice more than people in other countries and even though most of them did not think that global warming would be catastrophic. In fact, an identical number, 70 percent in the posttest, wanted the U.S. to lead international efforts to address the threat. (See Table 49.)

In response to another question with slightly different wording, 74 percent of the scientists called for the U.S. to take the lead in international efforts to combat global warming without waiting for other countries to act; among the panel, 82 percent favored this course of action in the posttest. In response to a third variation, similar proportions in each group said the greenhouse effect was a "serious national problem" that deserved to be a top priority. Asked to rank the issue on a scale of 1 to 10, a large percentage of the panel (64 percent) and of the scientists (57 percent) gave the issue a top priority rating of 8, 9 or 10. (See Tables 50 and 51.)

Below we compare in detail the two groups' reactions to the twenty-five proposals. In general, and with a few notable exceptions that we will discuss at length, the scientists views about what to do were remarkably consistent with the panel's preferences as expressed in the posttest.

3. By a margin of 45 to 18 percent, the scientists felt that public concern about the threat of global warming is "too low."

The scientists were asked to react to a recent statement by U.S. Environmental Protection Agency Director William K. Reilly that the public is "too concerned" about some environmental problems and "not concerned enough" about some others. We gave the scientists a list of ten issues and asked them whether, in their opinion, the level of public concern is too high, too low, or about right, given the threat to the environment and to public health.

Of the ten environmental issues, there were four where very large numbers of scientists said that public concern is too low -- and all four related to global warming. A whopping 74 percent said public concern about the destruction of the tropical rain forests is too low; 55 percent said public concern is too low about the effects of automobile exhaust; 50 percent said the public is not concerned enough about the effects of burning coal. Finally, 45 percent said that public concern about the threat of global warming caused by the greenhouse effect is also too low. That is, while a large minority said the public isn't concerned enough about the issue in a general sense, majorities felt that public concern is too low about three environmental threats that, in addition to other problems, contribute to the buildup of greenhouse gases. Only 18 percent said public concern about the greenhouse effect is "too high." (See Table 52.)

By way of comparison, solid or near majorities said they thought the level of public concern is too high about the treatment of laboratory animals (73 percent), the use of alar (64 percent), nuclear power plant safety (58 percent), forest fires in national parks (48 percent), and the applications of genetic research (46 percent). (See Table 52.)

Proposals That Were Endorsed by Both the Scientists and the Panel

1. In general, the scientists' prescriptions about what to do to reduce the buildup of greenhouse gases were remarkably similar to those of the panel in the posttest; with only a handful of exceptions, the differences between the two groups were differences of degree.

The scientists and the panel were given an identical list of twenty-five proposals to reduce the buildup of greenhouse gases, each with an accompanying sacrifice or trade-off. As discussed in detail below, most of those solutions endorsed by the scientists were endorsed by the panel, and most of the solutions rejected by the scientists were rejected by the panel in the posttest. Specifically, majorities in both groups accepted eleven of the proposals and rejected eight others. Only in six of the twenty-five cases did the two groups disagree, with the scientists, but not the panel, accepting four proposals, and the panel, but not the scientists, accepting two others. To a remarkable degree then, the two groups had analogous views about what should and should not be U.S. policy to reduce the buildup of greenhouse gases over the next ten years or so. With a few exceptions, any differences between the two groups were differences in degree. (See Tables 53, 54, 55, and 56 and Charts 6, 7, 8, and 9.)

2. Both groups wanted to implement eleven proposals to reduce the buildup of greenhouse gases either immediately or over the next ten years.

Of the twenty-five proposals to reduce greenhouse gases, eleven were favored by a majority of the scientists and the panel in the posttest. These proposals are:

- A 40 miles-per-gallon standard for new cars by the year 2000;
- Increased spending for mass transit;
- Tax incentives for builders using passive solar energy;
- The U.S. taking the lead in international efforts to address global warming;
- Requirements for business and industry to improve fuel efficiency;
- Tax incentives for industry to improve insulation;
- Requirements for utilities to burn less coal;
- Tax incentives for homeowners to improve insulation;
- Requirements for communities to plant more trees;
- More government funding for solar energy research and development; and
- Reducing the number of trees that can be cut in the U.S. each year. (See Table 53 and Charts 6 and 7.)

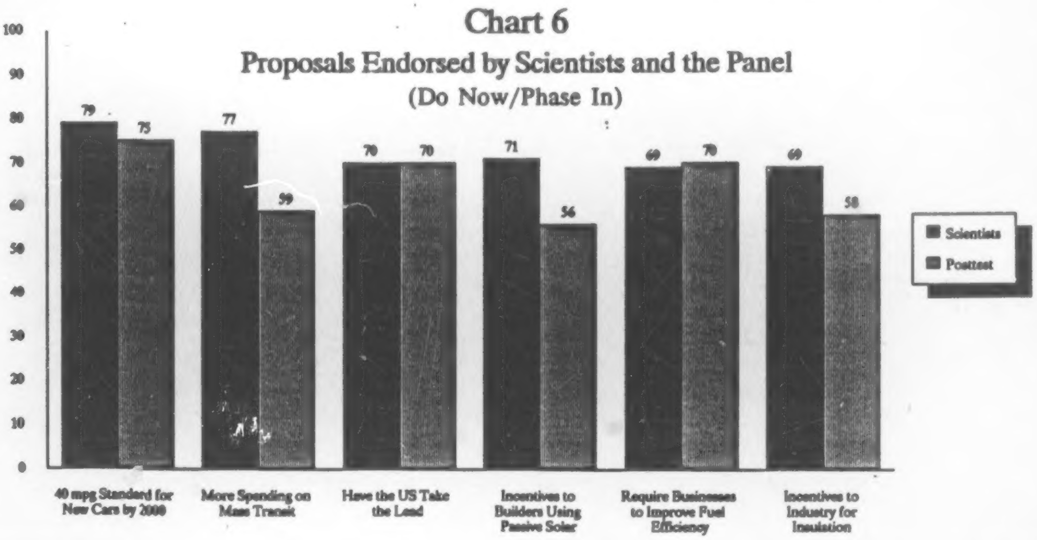


Chart 6
Proposals Endorsed by Scientists and the Panel
(Do Now/Phase In)

3. Two proposals were endorsed by a consensus-level of 75 percent or more of the scientists: a 40 miles-per-gallon requirement for new cars by the year 2000 and more spending for mass transit.

The most popular proposal among the scientists was raising the miles-per-gallon requirement for new cars to a fleet wide average of 40 mpg by the year 2000, "even if that would increase the price of new cars and decrease the performance of full-size cars and station wagons." Seventy-nine percent of the scientists endorsed this measure compared to 75 percent of the panel members in the posttest. (See Table 57.)

The idea of increasing spending on mass transit in urban areas "even if that would mean a tax increase of about $50 per year per taxpayer" was the second most popular measure and endorsed by 77 percent of the scientists; while there was somewhat less support for this proposal among the panel in the posttest, a large majority (59 percent in the posttest) did support this step. However, a few scientists were skeptical about this proposal, with one writing that "People don't use [mass transit] now." (See Table 57.)

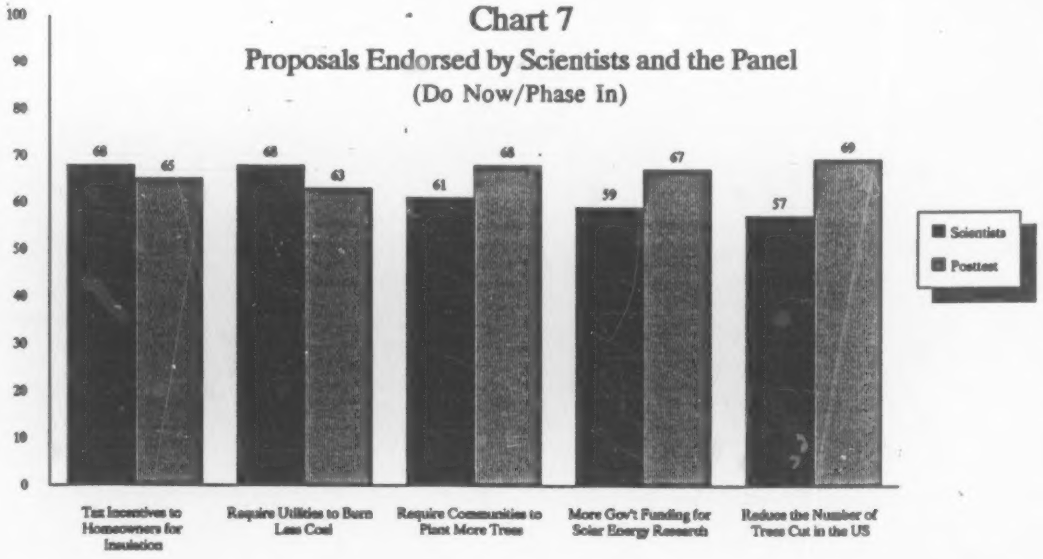


Chart 7

Proposals Endorsed by Scientists and the Panel

(Do Now/Phase In)

4. Like the panel, the scientists supported a number of proposals to conserve energy in the home and in business and industry. Both groups also favored requiring utilities to burn less coal.

The scientists and the panel favored two measures to reduce the amount of energy used to heat and cool people's homes. More than seven in ten scientists (71 percent) favored providing tax incentives to builders who construct homes and offices to take advantage of sunlight or passive solar energy "even if that would mean a tax increase of about $50 per year per taxpayer." Though there was comparatively less support, a majority of the panel (56 percent in the posttest) favored this proposal, too. Solid majorities in both groups also favored using tax incentives to encourage homeowners to improve their home insulation; 68 percent of the scientists and 65 percent of the panel supported this measure. However, one scientist wrote that this proposal would be "effective if done properly, but not [as it was] in the late 1970s." (See Table 58.)

The two groups also had similar views about two proposals to increase energy efficiency in business and industry. Sixty-nine percent of the scientists and 70 percent of the panel wanted to require business and industry to improve fuel efficiency or use less energy, "even if that would greatly increase their costs and the price of their products." One scientist who agreed with the prevailing sentiment wrote, "I'd be willing to bet this could be done without a great increase in costs." Both groups also wanted to encourage business and industry to increase insulation and energy efficiency, "even if that meant giving them large tax breaks." Sixty-nine percent of the scientists were in favor as was 58 percent of the panel. But at least one scientist who agreed with a widespread view among the panel wrote, "Industry will do this [because of] cost-savings; no special tax breaks [are] needed." (See Table 59.)

A majority among both groups also supported a proposal to reduce greenhouse gas emissions by requiring utilities to burn less coal either by using alternative fuels or by increasing energy efficiency. Again, support in both groups was at similar levels, with 68 percent of the scientists and 63 percent of the panel in favor, "even if this means many coal miners lose their jobs." However, one scientist reacted angrily to this idea, writing that this was an example of "typical stupid bureaucratic thinking! Just a decade ago, we required utilities to convert from oil, gas, etc. to coal (telling them and the public that coal is cheap, available, American, etc.). Now this would be a 180 degree turnaround." (See Table 59.)

5. The scientists and the panel also supported proposals to plant more trees and reduce the number of trees cut each year.

A majority among both groups supported a proposal similar to a recent Bush Administration initiative that would require communities to plant a large number of new trees, even if it would mean a tax increase of $50 per year per taxpayer. There was actually more support for this idea among the panel (68 percent in the posttest) than among the leading scientists (61 percent). But some scientists were concerned about the scope of this measure as proposed, and its possible effects on the environment. As noted earlier, a tax increase this size would generate just under $5 billion in new revenue. One scientist, noting the number of trees this proposal would involve, wrote, "This many trees would reduce living space in even a small town." Another wrote that while this was "a desirable program" the scope was too large, writing, "But $50 per taxpayer!" Two other scientists expressed concern about the amount of water that would be necessary to irrigate so many new trees, with a Southern Californian writing, "In Los Angeles this will mean we will have to steal more water from Mono Lake." (See Table 60.)

Both groups also agreed about the desirability of reducing the number of trees cut in the United States each year, "even if this would increase the price of paper products and might even put some logging companies out of business." Support was slightly higher among the panel (with 69 percent in favor) than among the scientists (with 57 percent in favor). Commenting on this proposal, one scientists wrote we should "stabilize the number of trees [cut] in the U.S.," while another wanted to "tax exported wood." A third scientist noted that "Ninety percent of the mail I receive ends up as solid waste" and suggested that this proposal could be achieved simply if we "reduce print advertising and junk mail." (See Table 60.)

6. Majorities among both groups also supported more government funding for solar energy research.

"Name one such program [using solar energy] that's worked."
--Scientist

Both groups favored more government funding for solar energy research and development. However, as with several other proposals, there was actually more support for this proposal in the panel (67 percent in favor) than there was among the scientists (59 percent in favor). This support is especially noteworthy because, as we discussed earlier, most of the scientists were not overly optimistic about active solar energy using photovoltaic cells, at least in the short term. For example, only 28 percent said that active solar energy could provide a "considerable amount" of the country's energy (at least one-fifth), even by the year 2025. Two scientists in particular expressed doubts about this proposal. "Name one such program [using solar energy] that's worked," one scientist wrote. Another noted that while there were "some hopes for home-oriented electrical generation," solar energy on a large scale will not be cost-effective "unless nuclear [power] is banned." But while another scientist acknowledged that though "big improvements are necessary," there should be more money spent in this area, writing, "How about some research money instead of $600 toilet seats?" (See Tables 61, 62 and 63.)

Proposals That Were Rejected by Both the Scientists and the Panel

1. The scientists and the panel both rejected eight proposals to reduce greenhouse gases, four of which related to the automobile.

Both groups opposed four measures aimed at reducing greenhouse gas emissions by reducing gasoline consumption. Two were rejected by comparatively narrow margins among the scientists, and two were solidly rejected. (See Chart 8.)

By margins of nearly three to two, the scientists opposed a ten cents a gallon gasoline tax for each of the next ten years (38 percent in favor, 55 percent against), and banning automobiles that get low gas mileage "even if that means banning most station wagons and sports cars" (37

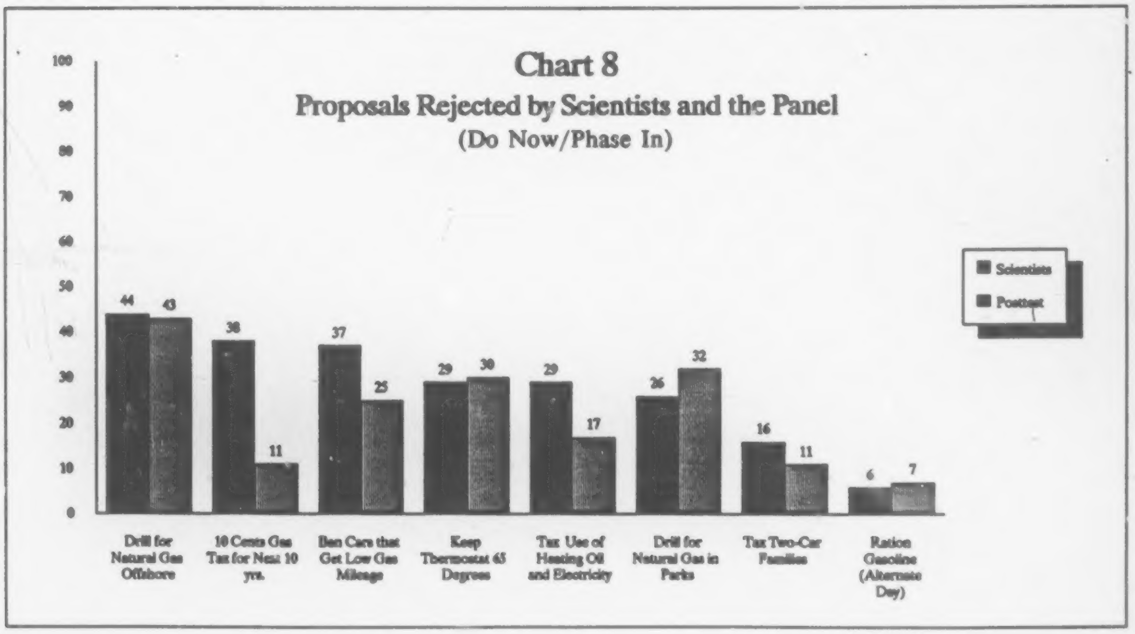


Chart 8

Proposals Rejected by Scientists and the Panel

(Do Now/Phase In)

percent in favor, 58 percent against). One scientist wrote that the latter proposal was "impractical." The panel also rejected both measures; only 25 percent wanted to ban cars that get poor gas mileage, and only 11 percent were in favor of a ten cents a gallon gasoline tax for each of the next ten years. (See Table 64.)

The scientists overwhelmingly rejected two other automobile-related proposals: imposing a special tax on families that buy a second car (16 percent in favor, 88 percent opposed) and rationing gasoline through alternate day-of-the-week buying (6 percent in favor, 91 percent opposed). As noted earlier, the panel also totally opposed both of these proposals, with only 11 and 7 percent in favor respectively. (See Table 64.)

2. Like the panel, the scientists rejected two proposals aimed at reducing energy use in the home: a tax on home heating oil, and a requirement that thermostats be kept no higher than 65 degrees in the winter.

Fewer than three scientists in ten favored a proposal that would require people to keep their thermostats no higher than 65 degrees, while allowing exceptions for the elderly and the sick. Twenty-nine percent of the scientists were in favor while 68 percent were opposed. One scientist sarcastically wondered if this measure would require "The Thermostat Police?" Another wrote, "Did you ever lecture when you were too cold to write on the blackboard?" Among the panel, virtually identical numbers favored (30 percent) and opposed (68 percent) this proposal. On another proposal involving the home, only 29 percent of the scientists favored taxing the use of home heating oil to discourage people from using it while 64 percent opposed the idea. Among panel members, the proposal was even less popular with only 17 percent in favor and 75 percent opposed. (See Table 65.)

> ***"Did you ever lecture when you were too cold to write on the blackboard?"***
> *--Scientist*

3. Both groups also rejected drilling for natural gas both offshore and in our national parks. However, as with the panel, there was a sizable minority in favor of offshore drilling.

Only 26 percent of the scientists wanted to increase drilling efforts for cleaner burning natural gas in our national parks while 68 percent were opposed. The proposal was rejected by a comparable number of panel members, with 32 percent of them in favor in the posttest, and 61 percent opposed. The idea of drilling offshore was narrowly rejected by the scientists, with 44 percent in favor and 51 percent opposed. Among the panel, the idea was also narrowly rejected, with 43 percent in favor and 50 percent opposed. One scientist wrote that both proposals were unnecessary because "there are already vast reserves of natural gas available but not used because of flaws in our policies and the resulting economic disadvantage to industry." (See Table 66.)

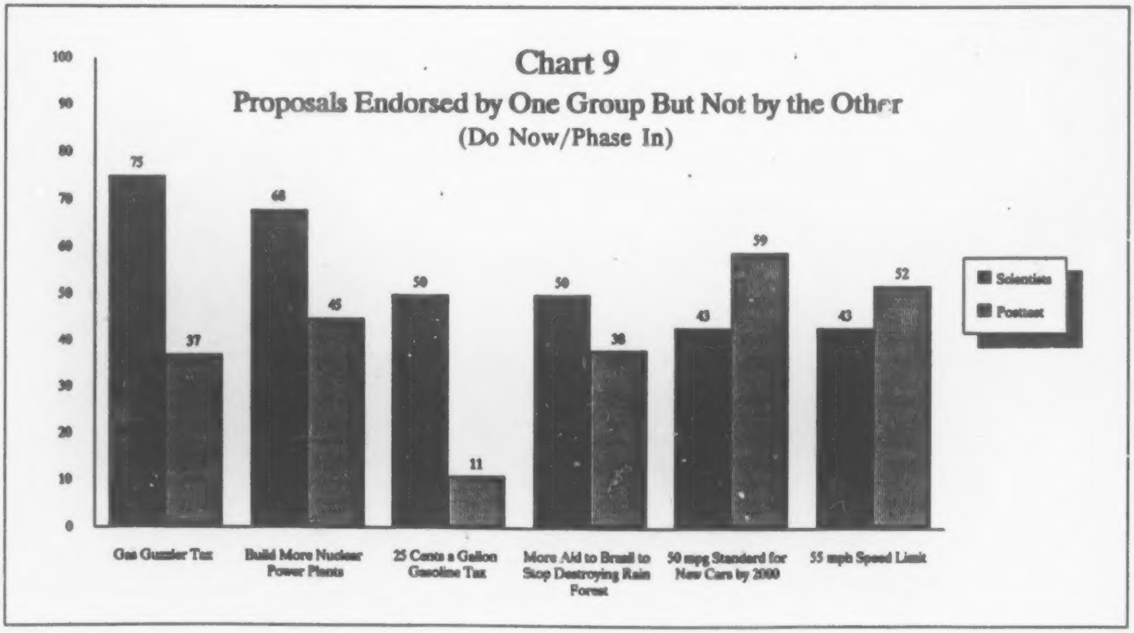


Chart 9
Proposals Endorsed by One Group But Not by the Other
(Do Now/Phase In)

Proposals That Were Endorsed By One Group, But Not the Other

1. The scientists endorsed four proposals that a majority of the panel did not: a gas guzzler tax, more nuclear power, a 25 cents a gallon gasoline tax, and more aid to Brazil if it stops destroying the rain forest. At the same time the scientists did not endorse two other proposals that a majority of the panel supported: increasing the miles-per-gallon requirement to 50 by the year 2000, and reimposing and strictly enforcing a 55 miles-per-hour speed limit.

A majority of the scientists, but not a majority of the panel, favored four of the twenty-five proposals. In one case -- providing more aid to Brazil if it stops destroying the rain forest -- the difference between the two groups was comparatively minor; 50 percent of the scientists were in favor compared to 38 percent of the panel. But with the other three proposals, the differences ranged upward from 23 percentage points (in the case of nuclear power) to 38 points in the case of a 25 cent gasoline tax. (See Table 55 and Chart 9.)

There were two other proposals of which a posttest majority of the panel was in favor but not a majority of the scientists. In one case, a 55 miles-per-hour speed limit, the difference between the two groups was only nine points; but in the case of a 50 mpg new car standard by the year 2000, 59 percent of the panel was in favor compared to 43 percent of the scientists, a 16 point difference. (See Table 56 and Chart 9.)

2. There was far more support for building more nuclear power plants among the scientists than there was among the panel.

More than two-thirds (68 percent) of the 418 leading scientists favored building more nuclear power plants, with 38 percent saying we should begin construction immediately and 30 percent saying we should phase in more plants over the next ten years. But among panel members in the posttest, only 45 percent were in favor, while 46 percent were opposed. In a related question, both groups were asked how much of this country's energy should be provided by nuclear power in the year 2025; 75 percent of the scientists said that at least 20 percent of the country's energy (that is, at least double the current level) should come from nuclear fission in the year 2025. But among the panel, only 47 percent said nuclear power should provide at least that much energy, a 28 percentage point difference. (See Tables 67, 68 and 69.)

Other results shed light on the scientists' reasoning. For example, the scientists agreed, by a margin of 79 to 12 percent, that nuclear power is not inherently too dangerous to rely on, that fission reactors that are well built and managed can be a "safe, reliable source of energy." One scientist wrote that whether to use more nuclear power plants depends on the terms under which they are built, and that he would be opposed if new nuclear power plants were "designed, constructed and inspected by the same company." (See Table 70.)

Another reason why support for nuclear power was higher among the scientists is the finding that the scientists were not very optimistic about alternatives. Although a large percentage (30 percent) was not sure, only one in five (21 percent) thought that nuclear fusion could provide at least five percent of the world's energy needs by the year 2025. As noted, the scientists were also somewhat less optimistic about the prospects for solar energy, at least over the next 35 years. Asked whether solar power could provide at least 20 percent of the country's energy needs by the year 2025, a higher percentage of the panel (37 percent) agreed than among the scientists (29 percent). The scientists were also more likely to say that solar power would contribute "very little" or less than 10 percent of the country's energy needs by 2025, with 29 percent of them holding this view compared to 16 percent of the panel. (See Tables 68, 69 and 71.)

> ***"[I would oppose nuclear power plants that were] designed, constructed and inspected by the same company."***
> *--Scientist*

Judging from responses to other questions, the scientists were aware of a gap between their thinking and the views of the public as expressed by the panel. For example, 76 percent of the scientists said that "most Americans" are opposed to building more nuclear power plants and 58 percent said that public concern about nuclear power plant safety is too high. One scientist wrote that public opinion about nuclear power amounts to "rampant hysteria." While this study suggests that the public is more nearly split on this issue than the scientists think, we did find a sizable minority who were strongly opposed. Most of the scientists, 62 percent, also said that the public had "unrealistic expectations" about nuclear power plant safety. One scientist wrote, "Fission will never achieve much wider acceptance due to perceived risks." (See Tables 52, 72, and 73.)

> ***"Fission will never achieve much wider acceptance due to perceived risks."***
> *--Scientist*

3. Unlike the panel, the scientists favored two taxation measures involving the automobile: a "gas guzzler" tax and a 25 cents a gallon tax on gasoline.

More than twice as many scientists as panel members favored a gas guzzler tax. In the posttest, only 37 percent of the panel favored this proposal compared to 75 percent among the scientists, a difference of 38 points. The scientists also narrowly favored the idea of a 25 cents a gallon gas tax, with 50 percent in favor and 44 percent opposed. But at least some support was conditional, with one scientist favoring the measure "only if the funds were used for [dealing with] the environment." However, the panel soundly rejected it, with only 11 percent in favor and 87 percent opposed. As discussed above, a larger gasoline tax, a ten cents a gallon increase for each of the next ten years, was not supported by either group. (See Table 74.)

In part, these differences can be traced to other findings. A majority of the scientists, 55 percent, said that the public was not concerned enough about the environmental effects of automobile exhaust. Recall too, how in the discussions, panel members felt that driving was necessary, not a discretionary activity. And even in the posttest, when 80 percent of the panel understood that auto emissions were a major cause of greenhouse gases, the citizen group still rejected the 25 cents a gallon gasoline tax overwhelmingly, with only 11 percent in favor. (See Tables 14, 52 and 74.)

When asked how they thought the public would feel about these two measures, a plurality of the scientists, 37 percent, said the public would oppose a gas guzzler tax, but 28 percent were not sure. And 77 percent of the scientists thought that the public would disapprove of a 25 cent gas tax. (See Table 75.)

4. The fourth proposal that was endorsed by the scientists and not the panel was giving more aid to Brazil if it stops destroying the rain forest.

By a margin of 50 to 35 percent, the scientists favored increasing aid to Brazil if it stops destroying the rain forest, even if this means increasing foreign aid and cutting spending in other areas. In response to the same question, only 38 percent of the panel supported the proposal while 50 percent opposed it. While the scientists almost certainly had a clearer understanding of this issue than the panel did, 78 percent of the panel said that the destruction of the tropical forest is a major cause of the buildup of greenhouse gases. (See Tables 52 and 76.)

One reason for the difference may be that the scientists were more aware of Brazil's economic development problems than the panel. As noted earlier, a number of panel members felt that instead of sending aid, the U.S. should educate the Brazilians about the destructive effects of cutting down the rain forest. Some held this view even after the moderator explained that the Brazilian government understood the global environmental impact of its policy, and that it was going ahead for reasons of economic development and in order to increase the standard of living for its people. In addition, many panel members were not confident that U.S. aid would actually get to the people it was intended to help. But while it seems fair to presume that the scientists had a more sophisticated understanding about deforestation and the issues surrounding it, it is noteworthy that the gap between the two groups was so small, only 12 percentage points. (See Table 76.)

We also asked the scientists how they thought the public felt about this issue; by a margin of 40 to 21 percent, they thought that the public would oppose more aid to Brazil, with a very large number, 39 percent, saying they were not sure how the public would feel. (See Table 75.)

5. Two proposals were supported by a majority of the panel but not the scientists: a 50 miles-per-gallon standard requirement for new cars by the year 2000, and a return to a 55 miles-per-hour speed limit that would be strictly enforced.

By a narrow margin, the scientists rejected requiring auto makers to achieve a fleet-wide average of 50 mpg by the year 2000. While 43 percent favored this proposal, 49 percent were opposed. But among the panel, a clear majority, 59 percent, was in favor while 35 percent were opposed. We speculate that the scientists were less optimistic that the auto industry could easily and inexpensively accomplish this goal, a consideration raised by a number of respondents in the discussions. Therefore the difference may be explained in part by how the two groups perceive the difficulty of implementing this proposal, at least by the year 2000. (See Table 77.)

The scientists also did not favor reimposing and strictly enforcing a 55 mph speed limit. A majority, 52 percent, opposed this measure, while 43 percent endorsed it. In comparison, 52 percent of the panel endorsed this solution, while 46 percent rejected it. One scientist probably expressed the views of a number of colleagues, writing that such a law would simply be "unenforceable," implying that no matter what people say, they will not go along. (See Table 77.)

Notes

1 For a more complete description of the process, please see Appendix A.

2 A rating of 8, 9 or 10 on a scale of 1 to 10 where 1 means "Not serious at all, should get the lowest priority" and 10 means "Extremely serious, should get the highest priority."

3 We included only those proposals that have an accompanying sacrifice or trade-off. While it is true that many conservation activities are very cost effective and involve no sacrifice or trade-off, we presumed these proposals would not be blocked by public opinion.

4 The quotes and qualitative analysis are derived from tape recordings of the sessions.

5 The 1987 edition of *The Statistical Abstract of the United States* reports that just under 97,000,000 tax returns were filed in 1985. Multiplying the number of tax returns by $50 means that an annual increase of $50 per taxpayer would generate just under $5 billion in additional federal revenue, a large enough sum to finance significant initiatives -- in this case, generous enough incentives to encourage large numbers of homeowners to improve their home insulation.

6 According to the World Resources Institute, 31 percent of the carbon dioxide emissions from the United States come from the transportation sector, including cars, trucks, buses, etc. Of these sources, the automobile is by far the largest contributor.

7 Carbon dioxide currently is responsible for about fifty percent of global warming. Not only is it the biggest single source, carbon dioxide is also an otherwise harmless gas that is generated from familiar sources, and is not already subject to regulation or treaty as other greenhouse gases, such as chlorofluorocarbons, are. For these reasons we focused only on carbon dioxide and not on the other greenhouse gases.

8 For a complete analysis of the panel's feelings about solid waste disposal, see *Science and the Public: Volume II: The Disposal of Solid Waste*, The Public Agenda Foundation, 1990.

9 In a survey of 418 leading scientists conducted as part of this project, 10 percent said that by 2050, global warming caused by the greenhouse effect would "cause widespread flooding, famine and environmental devastation," while 76 percent said it would "cause slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow," and 14 percent were not sure. For a complete description of the scientists interviewed, please see Appendix D.

10 For a complete description of the intervention see Appendix A.

11 For a further discussion of the panel's reaction to expert uncertainty, please see *Science and the Public: Volume I: Searching for Common Ground on Issues Related to Science and Technology*.

12 One might wonder if the rate of change in global warming and the age of the respondents would influence their level of concern (the older people might be less concerned about the greenhouse effect because they presumably will not live to see the change). But as we discuss later, respondents of all ages were very concerned about the long--term fate of the earth and the legacy they would leave their children and grandchildren. We found no evidence to suggest that the older respondents were less concerned about the greenhouse effect.

13 For a complete description of the panel's views about the disposal of solid waste see: *Science and the Public: Volume II: The Disposal of Solid Waste.*

14 For a further discussion of the panel's reaction to expert uncertainty, please see *Science and the Public: Volume I: Searching for Common Ground on Issues Related to Science and Technology.*

15 As noted earlier, a tax increase of about $50 per year per taxpayer would generate about five billion dollars in federal revenue.

16 The 418 leading scientists surveyed as part of this project thought that solar energy could provide just over 15 percent of the country's energy needs by the year 2025. (See Table 62.)

17 William K. Stevens, "To Halt Climatic Change, Scientists Try Trees." *The New York Times*, July 18, 1989.

18 See, for example, "Restoring Confidence in Nuclear Energy," by U.S. Senator Joseph Biden in *Issues in Science and Technology*, Volume V, Number 3, The National Academy of Sciences, 1989.

19 Earlier in the report, we asked the panel about requiring utilities to use more natural gas with the trade-off being that some coal miners would lose their jobs. In that context, increasing the use of natural gas was supported by the panel. However, we did not specify where the new drilling would take place. Also we are aware that much natural gas is available from less contentious locations. However, except for the chance that coal miners would lose their jobs, such drilling seemed unexceptionable.

20 For a complete description of the scientists interviewed, please see Appendix D.

21 One reviewer wrote that "gradualism has been a basic tenet of earth science since the 19th Century. It is being challenged by a small number of researchers, but these views are still very much in the minority."

22 For a complete listing of states in each region, please see the map that follows.

TABLE 1
Familiarity with the Greenhouse Effect
(Pretest)

"Have you heard or read anything about the greenhouse effect?"

Heard or Read About the Greenhouse Effect:	Pretest
	%
Yes	76
No	16
Not sure	9

TABLE 2
Familiarity with the Greenhouse Effect
(Union of Concerned Scientists, 1989)

"Have you read and/or heard anything about global warming sometimes called a 'greenhouse effect?'"

Read and/or Heard About the Greenhouse Effect:	UCS, 1989	Total
	%	%
Yes, global warming	3	
Yes, greenhouse effect	27	79
Yes, both	49	
No	20	
Don't know/refused	1	

Study conducted by Research/Strategy/Management Inc. for the Communications Consortium and the Union of Concerned Scientists of 1200 national registered voters in November 1989.

TABLE 3
Familiarity with the Greenhouse Effect
(Parents Magazine, 1988)

"Have you read or heard anything about the greenhouse effect?"

Read or Heard About the Greenhouse Effect:	Parents Magazine, 1988
	%
Yes	58
No	40
Not sure	2

Study conducted by Kane, Parsons and Associates for Parents magazine of 1000 adults nationwide, aged 21 years and older during September and October 1988.

TABLE 4
Perceived Causes Of The Greenhouse Effect
(Pretest)

"Indicate whether you think each of the following is a major cause of the greenhouse effect, a minor cause, or not a cause at all:"

	Pretest
	%
Pollution/emissions from business and industry	
Major cause	77
Minor cause	10
Not a cause	1
Not sure	12
People driving their cars	
Major cause	52
Minor cause	32
Not a cause	3
Not sure	13
The destruction of tropical forests in Brazil and other countries	
Major cause	52
Minor cause	12
Not a cause	6
Not sure	30

Table 4
(Continued)

	Pretest
	%
The use of pesticides*	
Major cause	39
Minor cause	27
Not a cause	15
Not sure	20
Nuclear power plant pollution/emissions*	
Major cause	37
Minor cause	19
Not a cause	19
Not sure	24
The use of coal by utilities or electric companies	
Major cause	32
Minor cause	28
Not a cause	7
Not sure	34
People heating and cooling their homes	
Major cause	10
Minor cause	40
Not a cause	25
Not sure	25
Solar energy*	
Major cause	3
Minor cause	6
Not a cause	68
Not sure	24

* Incorrect answer

TABLE 5
Level Of Concern About The Greenhouse Effect (Pretest)

"Regarding the greenhouse effect or global warming, do you personally worry about this problem a great deal, a fair amount, only a little, or not at all?"

Regarding the greenhouse effect or global warming, do you personally worry about this:

	Pretest	Total
	%	%
A great deal	10	38
A fair amount	28	
Only a little	33	46
Not at all	13	
Not sure	17	

TABLE 6
Perceived Seriousness Of Various National Issues (Pretest)

"There are many serious issues facing our country and we'd like to know which ones you think are the most serious. Indicate how serious you think each issue is using a scale of 1 to 10 where 1 means "Not serious at all, should get the lowest priority" and 10 means "Extremely serious, should get the highest priority."

	Top Priority*
National Issue	Pretest
	%
Increase efforts to fight illegal drug use	79
Reduce smog and air pollution, especially in big cities like Los Angeles and Houston	75
Stop the destruction of the ozone layer that protects us from harmful solar rays	75
Fight the spread of AIDS	72
Reduce the federal budget deficit	63
Increase the amount of bottles, cans, newspapers and other garbage that we recycle	56
Reduce emissions that cause acid rain	56
Take decisive action to combat global warming caused by the greenhouse effect	47
Establish more government-funded day care centers for children from low and middle-income families	40
Send a manned space ship to the planet Mars	13

* "Top priority" equals the percentage of respondents giving the issue a score of 8, 9 or 10 on a scale of 1 to 10 where 1 means "Not serious at all, should get the lowest priority," and 10 means "Extremely serious, should get the highest priority."

TABLE 7
Predicted Seriousness Of Global Warming (Pretest)

"Which statement comes closer to your own view?

If things keep going as they are, by about 2050 global warming caused by the greenhouse effect will:

A. Cause widespread flooding, famine and environmental devastation.
OR
B. Cause slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow."

Statement	Pretest
	%
Cause widespread environmental devastation	18
Cause slow, incremental change	48
Not sure	34

TABLE 8

Whether the U.S. Should Take the Lead In International Efforts to Combat the Threat of Global Warming (Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Have the U.S. take the lead in international efforts to address the greenhouse effect even if American companies and citizens would have to make more sacrifices than people in other countries"

	Pretest	Total
	%	%
Do immediately	26	55
Phase in	29	
Only if serious	21	29
Don't do	8	
Not sure	16	

TABLE 9
Proposals That Were Accepted in the Pretest (Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

Proposal	Pretest
	%
Give tax breaks to homeowners who improve home insulation	61
Require businesses to improve fuel efficiency	59
Give tax breaks to builders who take advantage of passive solar energy	56
Increase the miles-per-gallon standard to 40 by the year 2000	55
Have the U.S. take the lead in international efforts to address the greenhouse effect	55
Require communities to plant a large number of new trees each year	55
Give tax breaks to industries who increase insulation and energy efficiency	55

*Please refer to Tables 8, 10, 11, 12, and 13 for complete question wording.

TABLE 10
Views About Proposals Involving the Home
(Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Give tax breaks to homeowners who improve their home insulation even if that would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Total
	%	%
Do immediately	31	61
Phase in	30	
Only if serious	12	28
Don't do	16	
Not sure	12	

"Give tax breaks to builders who construct homes and offices to take advantage of sunlight/passive solar energy even if that would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Total
	%	%
Do immediately	24	56
Phase in	32	
Only if serious	17	31
Don't do	14	
Not sure	14	

TABLE 11
Views About Proposals Involving Business and Industry (Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Require businesses to improve fuel efficiency or use less energy, even if that would greatly increase their costs and the price of their products"

	Pretest	Total
	%	%
Do immediately	19	59
Phase in	40	
Only if serious	24	30
Don't do	6	
Not sure	12	

"Encourage industries to increase insulation and energy efficiency even if this would mean giving them large tax breaks"

	Pretest	Total
	%	%
Do immediately	25	55
Phase in	30	
Only if serious	18	31
Don't do	13	
Not sure	13	

TABLE 12
Views About a Proposal Involving Automobiles (Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Increase the miles-per-gallon standard for new cars to 40 mpg by the year 2000 even if that would increase the price of new cars and decrease the performance of full-size cars and station wagons"

	Pretest	Total
	%	%
Do immediately	21	55
Phase in	34	
Only if serious	23	35
Don't do	12	
Not sure	11	

TABLE 13
Views About a Proposal Involving Planting More Trees (Pretest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Require communities to plant a large number of new trees each year even if this would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Total
	%	%
Do immediately	28	55
Phase in	27	
Only if serious	16	29
Don't do	13	
Not sure	16	

TABLE 14
Perceived Causes Of The Greenhouse Effect (Comparison of Pretest and Posttest)

"Indicate whether you think each of the following is a major cause of the greenhouse effect, a minor cause, or not a cause at all:"

	Pretest	Posttest	Change
	%	%	
Pollution/emissions from business and industry			
Major cause	77	84	+7
Minor cause	10	9	-1
Not a cause	1	3	+2
Not sure	12	4	
People driving their cars			
Major cause	52	80	+28
Minor cause	32	16	-16
Not a cause	3	2	-1
Not sure	13	2	

TABLE 14
(continued)

	Pretest	Posttest	Change
	%	%	
The destruction of tropical forests in Brazil and other countries			
Major cause	52	78	+26
Minor cause	12	14	+2
Not a cause	6	2	-4
Not sure	30	6	
The use of pesticides*			
Major cause	39	22	-17
Minor cause	27	29	+2
Not a cause	15	35	+20
Not sure	20	14	
Pollution/emissions from nuclear power plants*			
Major cause	37	17	-20
Minor cause	19	19	nc
Not a cause	19	57	+38
Not sure	24	8	
The use of coal by utilities or electric companies			
Major cause	32	71	+39
Minor cause	28	20	-8
Not a cause	7	2	-5
Not sure	34	7	
People heating and cooling their homes			
Major cause	10	39	+29
Minor cause	40	50	+10
Not a cause	25	7	-18
Not sure	25	4	
Solar energy*			
Major cause	3	2	-1
Minor cause	6	6	nc
Not a cause	68	83	+15
Not sure	24	9	

* Incorrect answer

TABLE 15

Level Of Concern About The Greenhouse Effect (Comparison of Pretest and Posttest)

"Regarding the greenhouse effect or global warming, do you personally worry about this problem a great deal, a fair amount, only a little, or not at all?"

Regarding the greenhouse effect or global warming, do you worry about this:

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
A great deal	10	38	21	65	+27
A fair amount	28		44		
Only a little	33	46	29	34	-12
Not at all	13		5		
Not sure	17		1		

TABLE 16
Perceived Seriousness Of Various National Issues (Comparison of Pretest and Posttest)

"There are many issues facing our country and we'd like to know which ones you think are the most serious. Indicate how serious you think each issue is using a scale to 1 to 10 where 1 means 'Not serious at all, should get the lowest priority' and 10 means 'Extremely serious, should get the highest priority.' (Write in a number from 1 to 10.)"

	Top Priority*		
National issue	Pretest	Posttest	Change
	%	%	
Increase efforts to fight illegal drug use	79	76	-3
Reduce smog and air pollution, especially in big cities like Los Angeles and Houston	75	71	-4
Stop the destruction of the ozone layer that protects us from harmful solar rays	75	70	-5
Fight the spread of AIDS	72	71	-1
Reduce the federal budget deficit	63	55	-8
Increase the amount of bottles, cans, newspapers and other garbage that we recycle	56	64	+8
Reduce emissions that cause acid rain	56	58	+2
Take decisive action to combat global warming caused by the greenhouse effect	47	64	+17
Establish more government-funded day care centers for children from low and middle-income families	40	37	-3
Send a manned space ship to the planet Mars	13	12	-1

* "Top priority" equals the percentage of respondents giving the issue a score of 8, 9 or 10 on a scale of 1 to 10 where 1 means "Not serious at all, should get the lowest priority," and 10 means "Extremely serious, should get the highest priority."

TABLE 17
Predicted Seriousness Of Global Warming (Comparison of Pretest and Posttest)

"Which statement comes closer to your own view?

If things keep going as they are, by about 2050 global warming caused by the greenhouse effect will:

A. Cause widespread flooding, famine and environmental devastation.
OR
B. Cause slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow."

Statement	Pretest	Posttest	Change
	%	%	
Cause widespread environmental devastation	18	20	+2
Cause slow, incremental change	48	62	+14
Not sure	34	18	

TABLE 18
Should We Take Action or Wait for More Evidence? (Posttest)

"Which statement comes closer to your own view?

A. Before taking decisive action to deal with the greenhouse effect, we should wait for more conclusive scientific evidence.
OR
B. If we wait for more conclusive scientific evidence before taking decisive action to deal with the greenhouse effect, it will be too late."

Statement	Posttest
	%
Wait for more conclusive evidence	29
If we wait, it will be too late	60
Not sure	11

TABLE 19
Whether the U.S. Should Take the Lead In International Efforts to Combat the Threat of Global Warming (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Have the U.S. take the lead in international efforts to address the greenhouse effect even if American companies and citizens would have to make more sacrifices than people in other countries"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	26	55	40	70	+15
Phase in	29		30		
Only if serious	21	29	16	24	-5
Don't do	8		8		
Not sure	16		6		

TABLE 20
Should We Wait for Other Countries To Act? (Posttest)

"Indicate whether you agree or disagree with the statements below:"

"The U.S should take the lead in addressing the greenhouse effect without waiting for other countries to act."

The U.S. should take the lead:	Posttest
	%
Agree	82
Disagree	7
Not sure	11

TABLE 21
Should We Wait for Other Countries To Act?
(Union of Concerned Scientists, 1989)

"Because the U.S. is the largest contributor of global warming gases, some have argued that the U.S. must take the lead in fighting global warming. Others have argued that the U.S. should wait until there is an international agreement for all nations to move together to fight this problem. Which of these two positions comes closest to your view?"

Statement	UCS, 1989
	%
U.S. should take the lead	72
U.S. should wait for international agreement	24
Don't know/Refused	4

Study conducted by Research/Strategy/Management Inc. for the Union of Concerned Scientists of 1200 national registered voters in November 1989.

TABLE 22
Has Global Warming Already Started?
(Posttest)

"Indicate whether you agree or disagree with the statements below:"

"Global warming caused by the greenhouse effect has already started."

Global warming has started:	Posttest
	%
Agree	73
Disagree	6
Not sure	21

TABLE 23
Proposals That Were Accepted in the Posttest
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

Proposal	Pretest	Posttest	Change
	%	%	
Give tax breaks to homeowners who improve home insulation	61	65	+4
Require businesses to improve fuel efficiency	59	70	+11
Give tax breaks to builders who take advantage of passive solar energy	56	56	nc
Increase the miles-per-gallon standard to 40 by the year 2000	55	75	+20
Have the U.S. take the lead in international efforts to address the greenhouse effect	55	70	+15
Require communities to plant a large number of new trees each year	55	68	+13
Give tax breaks to industries who increase insulation and energy efficiency	55	58	+3
Reduce the number of trees that may be cut down in the U.S.	48	69	+21
Require utilities to burn less coal	47	63	+16
Increase spending on mass transit	47	59	+12
Increase government funding for solar energy research	43	67	+24
Reimpose and strictly enforce a 55 miles-per-hour speed limit	43	52	+9
Increase the miles-per-gallon standard to 50 by the year 2000	39	59	+20

*Please refer to Tables 19 and 24 through 34 for complete question wording.

TABLE 24
Views About Proposals Involving Transportation (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Reimpose and strictly enforce a nationwide speed limit of 55 mph even if that would inconvenience truckers and drivers, especially in western states"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	37	43	37	52	+9
Phase in	6		15		
Only if serious	25	50	21	46	-4
Don't do	25		25		
Not sure	7		2		

"Sharply increase spending on mass transit in urban areas even if that would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	23	47	33	59	+12
Phase in	24		26		
Only if serious	17	34	15	32	-2
Don't do	17		17		
Not sure	20		9		

TABLE 24
(continued)

"Increase the miles-per-gallon standard for new cars to 40 mpg by the year 2000 even if that would increase the price of new cars and decrease the performance of full-size cars and station wagons"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	21	55	31	75	+20
Phase in	34		44		
Only if serious	23	35	11	21	-14
Don't do	12		10		
Not sure	11		4		

"Increase the miles-per-gallon standard for new cars to 50 mpg by the year 2000 even if that would sharply increase the price of new cars and decrease the performance of full-size cars and station wagons"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	15	39	23	59	+20
Phase in	24		36		
Only if serious	28	47	22	35	-12
Don't do	19		13		
Not sure	15		7		

TABLE 25
Views About Higher Gas Mileage
(Union of Concerned Scientists, 1989)

"U.S. automobile makers have the technology to make cars averaging 45 miles per gallon well before the year 2000."

Statement	UCS, 1989	Total
	%	%
Strongly agree	54	83
Somewhat agree	29	
Somewhat disagree	6	
Strongly disagree	4	
Don't know\Refused	6	

Study conducted by Research/Strategy/Management for the Union of Concerned Scientists of 1200 national registered voters in November 1989.

TABLE 26
Views About a Proposal Involving Transportation
(Comparison of Education Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Sharply increase spending on mass transit in urban areas even if that would mean a tax increase of about $50 per year per taxpayer"

	High school or less	Some college	College graduate
	%	%	%
Do immediately	30	32	44
Phase in	27	27	24
Only if serious	18	13	13
Don't do	18	20	10
Not sure	10	8	9

TABLE 27
Views About a Proposal Involving Transportation (Comparison of Income Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Sharply increase spending on mass transit in urban areas even if that would mean a tax increase of about $50 per year per taxpayer"

	Less than $30,000	$30,000 to $50,000	Over $50,000
	%	%	%
Do immediately	27	38	41
Phase in	27	24	34
Only if serious	17	16	9
Don't do	18	17	10
Not sure	11	5	7

TABLE 28
Views About a Proposal Involving Transportation (Comparison of Locations, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Reimpose and strictly enforce a nationwide speed limit of 55 mph even if that would inconvenience truckers and drivers, especially in western states"

Posttest	Hartford	Nashville	Chicago	Los Angeles
	%	%	%	%
Do immediately	53	36	35	28
Phase in	8	15	22	13
Only if serious	17	21	19	25
Don't do	20	27	22	32
Not sure	2	2	2	2

TABLE 29

Views About Proposals Involving Residential Utility Use (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Give tax breaks to homeowners who improve their home insulation even if that would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	31	61	36	65	+4
Phase in	30		29		
Only if serious	12	28	10	28	nc
Don't do	16		18		
Not sure	12		8		

"Give tax breaks to builders who construct homes and offices to take advantage of sunlight/passive solar energy even if that would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	24	56	28	56	nc
Phase in	32		28		
Only if serious	17	31	13	34	+3
Don't do	14		21		
Not sure	14		10		

TABLE 30
Views About Proposals Involving Businesses and Industry (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Encourage industries to increase insulation and energy efficiency even if this would mean giving them large tax breaks"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	25	55	26	58	+3
Phase in	30		32		
Only if serious	18	31	15	35	+4
Don't do	13		20		
Not sure	13		7		

"Require businesses to improve fuel efficiency or use less energy, even if that would greatly increase their costs and the price of their products"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	19	59	32	70	+11
Phase in	40		38		
Only if serious	24	30	18	24	-6
Don't do	6		6		
Not sure	12		8		

TABLE 30
(Continued)

"Require utilities to burn less coal by using alternative fuels or increasing efficiency even if this means many coal miners would lose their jobs"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	12	47	20	63	+16
Phase in	35		43		
Only if serious	27	40	21	30	-10
Don't do	13		9		
Not sure	14		8		

TABLE 31
Views About Business and Industry
(Comparison of Pretest and Posttest)

"Do you agree or disagree with these statements?"

"If most businesses and industries were willing to take a small cut in profits, they could easily eliminate most pollution and other emissions contributing to the greenhouse effect"

Statement	Pretest	Posttest
	%	%
Agree	54	64
Disagree	15	22
Not sure	31	15

TABLE 32
Views About a Proposal Involving Solar Energy
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Increase government funding to spur development of solar energy even if many scientists doubt it will be a viable alternative in the foreseeable future"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	22	43	39	67	+24
Phase in	21		28		
Only if serious	14	28	14	25	-3
Don't do	14		11		
Not sure	28		9		

TABLE 33
Views About Solar Energy
(Comparison of Pretest and Posttest)

"Which statement comes closer to your own view?

The main reason why we don't use more solar energy today is because:

A. The big oil companies are trying to block the development of solar energy in order to protect their profits
OR
B. Solar energy is simply too expensive, given our present technology"

Statement	Pretest	Posttest	Change
	%	%	
Oil companies are blocking the profits	37	41	+4
Solar energy is too expensive	35	49	+14
Not sure	28	10	

TABLE 34
Views About Proposals Involving Trees
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Require communities to plant a large number of new trees each year even if this would mean a tax increase of about $50 per year per taxpayer"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	28	55	39	68	+13
Phase in	27		29		
Only if serious	16	29	13	26	-3
Don't do	13		13		
Not sure	16		6		

"Reduce the number of trees that can be cut in the U.S. each year even if this would increase the price of paper products and might even put some logging companies out of business"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	19	48	37	69	+21
Phase in	29		32		
Only if serious	27	41	19	27	-14
Don't do	14		8		
Not sure	11		5		

TABLE 35
Proposals That Were Rejected in Both the Pretest and the Posttest
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	Do Now/Phase In		
Proposal*	Pretest	Posttest	Change
	%	%	
Impose a tax on "gas guzzlers," cars that get poor gas mileage	42	37	-5
Drill for natural gas offshore	41	43	+2
Build more nuclear power plants	36	45	+9
Give aid to Brazil to stop destroying the rain forests	33	38	+5
Ban cars that get low gas mileage	25	25	nc
Require people to keep their thermostats at 65 degrees	23	30	+7
Drill for natural gas in national parks	19	32	+13
Impose a 10 cents per gallon tax over each of the next ten years	12	11	-1
Tax homeowners' use of home heating oil	11	17	+6
Impose a 25 cents per gallon gas tax	9	11	+2
Tax two car families	8	11	+3
Ration gasoline (alternate day buying)	6	7	+1

*Please refer to Tables 36 through 43 for complete question wording.

TABLE 36
Views About Nuclear Power Plants
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect) even if that means living with the risks posed by that technology"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	18	36	20	45	+9
Phase in	18		25		
Only if serious	18	45	15	46	+1
Don't do	27		31		
Not sure	19		10		

TABLE 37
Views About Nuclear Power
(Union of Concerned Scientists, 1989)

"Would you favor or oppose a proposal to build more nuclear power plants in the United States? (If favor/oppose, ask) Would that be strongly (favor/oppose) or just somewhat (favor/oppose)?"

Build more nuclear power plants:	UCS, 1989	Total
	%	%
Strongly favor	16	33
Somewhat favor	17	
Somewhat oppose	17	
Strongly oppose	45	
Don't know/Refused	4	

Study conducted by Research/Strategy/Management for the Union of Concerned Scientists of 1200 national registered voters in November 1989.

TABLE 38
Views About Drilling for Natural Gas
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Encourage exploration for clean burning natural gas even if that would mean drilling off the coast of California, the east coast, etc."

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	20	41	23	43	+2
Phase in	21		20		
Only if serious	26	42	35	50	+8
Don't do	16		15		
Not sure	16		7		

"Encourage exploration for clean burning natural gas even if that would mean drilling in our national parks and threatening the environment"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	8	19	15	32	+13
Phase in	11		17		
Only if serious	34	69	37	61	-8
Don't do	35		24		
Not sure	12		7		

TABLE 39
Views About Drilling for Natural Gas
(Comparison of Regions, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Encourage exploration for clean burning natural gas even if that would mean drilling off the coast of California, the east coast, etc."

Posttest

	Hartford	Nashville	Chicago	Los Angeles
	%	%	%	%
Do immediately	27	26	18	20
Phase in	25	19	19	16
Only if serious	29	35	39	41
Don't do	19	14	19	19
Not sure	9	7	6	5

TABLE 40
Views About Taxes and Bans on Gas Guzzlers (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Impose a tax on 'gas guzzlers,' cars that get poor gas mileage even if that would sharply increase the cost of full-size cars and station wagons"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	19	42	15	37	-5
Phase in	23		22		
Only if serious	22	50	20	60	+10
Don't do	28		40		
Not sure	8		4		

"Ban cars that get low gas mileage even if that means banning most sports cars and station wagons"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	11	25	9	25	nc
Phase in	14		16		
Only if serious	24	62	26	70	+8
Don't do	38		44		
Not sure	13		6		

TABLE 41
Views About Foreign Aid to Stop Destroying the Rain Forest
(Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Give more aid to Brazil if they stop destroying the rain forests even if this means increasing foreign aid and cutting spending in other areas"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	14	33	16	38	+5
Phase in	19		22		
Only if serious	20	47	18	50	+3
Don't do	27		32		
Not sure	21		11		

TABLE 42
Views About Proposals Involving Heating Homes (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"While making exceptions for the elderly and the sick, require people to keep their thermostat no higher than 65 degrees even if this would be extremely difficult to enforce"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	11	23	15	30	+7
Phase in	12		15		
Only if serious	28	68	25	68	nc
Don't do	40		43		
Not sure	9		4		

"Discourage the use of heating oil, natural gas, and electricity through taxation even if that would significantly increase heating costs for homeowners and renters"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	3	11	5	17	+6
Phase in	8		12		
Only if serious	25	75	32	75	nc
Don't do	50		43		
Not sure	15		8		

TABLE 43
Views About Proposals Involving the Automobile (Comparison of Pretest and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Raise the gasoline tax by 25 cents a gallon even if that would burden truckers and others who need their cars for work"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	2	9	5	11	+2
Phase in	7		6		
Only if serious	24	83	22	87	+4
Don't do	59		65		
Not sure	8		3		

"Raise the gasoline tax by 10 cents a year for each of the next ten years until the increase equals a total of $1.00 per gallon even if that would seriously burden truckers and others who need their cars for work"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	4	12	4	11	-1
Phase in	8		7		
Only if serious	23	79	21	85	+6
Don't do	56		64		
Not sure	9		4		

TABLE 43
(continued)

"Discourage two-car families by making families that buy a second car pay a very steep tax even if this would be a hardship for many people"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	4	8	4	11	+3
Phase in	4		7		
Only if serious	17	85	17	84	-1
Don't do	68		67		
Not sure	8		5		

"Ration gasoline through alternate day-of-the-week buying even if that would be a hardship for many people, especially people who need their cars for work"

	Pretest	Pretest Total	Posttest	Posttest Total	Change
	%	%	%	%	
Do immediately	1	6	2	7	+1
Phase in	5		5		
Only if serious	23	88	20	91	+3
Don't do	65		71		
Not sure	6		3		

TABLE 44
Views About a Gas Tax
(Time Magazine/CNN, 1989)

"To conserve more energy, do you think we should raise the tax on gasoline?"

Raise gasoline tax:	Time/CNN, 1989
	%
Yes	21
No	77
Not sure	2

Study conducted by Yankelovich Clancy Shulman for Time Magazine/CNN of 1012 national adults in April 1989.

TABLE 45
Whether Global Warming Caused By The Greenhouse Effect Has Started
(Scientists)

"Indicate whether you agree or disagree with the statements below:"

"Global warming caused by the greenhouse effect has already started."

Global warming has already started:	Scientists
	%
Agree	40
Disagree	13
Not sure	47

TABLE 46
Predictions About Global Warming Caused By the Greenhouse Effect
(Scientists)

"Indicate whether you agree or disagree with the statements below:"

"Unless we take action, global warming caused by the greenhouse effect will cause major, widespread environmental devastation by the year 2000."

Global warming will cause environmental devastation:	Scientists
	%
By the year 2000	
Agree	6
Disagree	59
Not sure	35
By the year 2050	
Agree	29
Disagree	19
Not sure	52
By the year 2100	
Agree	55
Disagree	7
Not sure	38

TABLE 47
Predictions About The Greenhouse Effect In The Year 2050
(Comparison of Scientists and Posttest)

"Which statement comes closer to your own view?

If things keep going as they are, by about 2050 global warming caused by the greenhouse effect will:

A. Cause widespread flooding, drought, famine and environmental devastation.
OR
B. Cause slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow."

Statement	Scientists	Posttest
	%	%
Cause widespread environmental devastation	10	20
Cause slow, incremental change	76	62
Not sure	14	18

TABLE 48
Should We Take Action or Wait for More Evidence?
(Comparison of Scientists and Posttest)

"Which statement comes closer to your own view?

A. Before taking decisive action to deal with the greenhouse effect, we should wait for more conclusive scientific evidence.
OR
B. If we wait for more conclusive scientific evidence before taking decisive action to deal with the greenhouse effect, it will be too late."

Statement	Scientists	Posttest
	%	%
Wait for more conclusive evidence	34	29
If we wait, it will be too late	58	60
Not sure	8	11

TABLE 49
Whether the U.S. Should Take the Lead In International Efforts to Combat the Threat of Global Warming
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Have the U.S. take the lead in international efforts to address the greenhouse effect even if American companies and citizens would have to make more sacrifices than people in other countries"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	42	70	40	70	nd
Phase in	28		30		
Only if serious	18	27	16	24	-3
Don't do	9		8		
Not sure	4		6		

TABLE 50
The U.S. Should Take the Lead
(Comparison of Scientists and Posttest)

"Indicate whether you agree or disagree with the statements below:"

"The U.S. should take the lead in addressing the greenhouse effect without waiting for other countries to act."

Statement	Scientists	Posttest
	%	%
Agree	74	82
Disagree	12	7
Not sure	7	11

TABLE 51
Perceived Seriousness Of Various National Issues (Comparison of Scientists and Posttest)

"There are many issues facing our country and we'd like to know which ones you think are the most serious. Indicate how serious you think each issue is using a scale of 1 to 10 where 1 means 'Not serious at all, should get the lowest priority' and 10 means 'Extremely serious, should get the highest priority.' (Write in a number from 1 to 10.)"

	Top Priority*	
National issue	Scientists	Posttest
	%	%
Stop the destruction of the ozone layer that protects us from harmful solar rays	60	70
Reduce the federal budget deficit	58	55
Take decisive action to combat global warming caused by the greenhouse effect	57	64
Increase efforts to fight illegal drug use	56	76
Reduce smog and air pollution, especially in big cities like Los Angeles and Houston	48	71
Reduce emissions that cause acid rain	48	58
Fight the spread of AIDS	44	71
Increase the amount of bottles, cans, newspapers and other garbage that we recycle	42	64
Establish more government-funded day care centers for children from low and middle-income families	23	37
Send a manned space ship to the planet Mars	15	12

* "Top priority" equals the percentage of respondents giving the issue a score of 8, 9 or 10 on a scale of 1 to 10 where 1 means "Not serious at all, should get the lowest priority," and 10 means "Extremely serious, should get the highest priority."

TABLE 52
Views About The Level Of Public Concern Regarding Various Issues
(Scientists)

"EPA Director William Reilly recently said Americans are 'too concerned' about some threats to the environment and public health, and 'not concerned enough' about others. For each threat below, indicate whether you think the level of public concern is too high, too low, or about right."

	Level of Public Concern is:			
Threats to the Environment	Too High	About Right	Too Low	Not Sure
	%	%	%	%
The treatment of laboratory animals used in scientific/medical research	73	19	5	3
The use of alar in growing apples	64	23	5	9
Nuclear power plant safety	58	32	8	2
Forest fires in Yellowstone and other national parks	48	36	7	8
The applications of genetic research	46	31	12	11
The safety of solid waste-to-energy incinerators	33	32	10	26
The threat of global warming from the greenhouse effect	18	28	45	8
The effects of burning coal	9	35	50	7
Destroying the tropical rain forests	7	15	74	4
The effects of automobile exhaust	3	40	55	2

TABLE 53
Proposals That Were Accepted by the Scientists and the Panel
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Scientists	Posttest	Difference
	%	%	
40 mpg standard for new cars by 2000	79	75	-4
More spending on mass transit	77	59	-18
Tax breaks to builders for passive solar	71	56	-15
Have the U.S. take the lead in international efforts	70	70	nd
Require businesses to improve fuel efficiency	69	70	+1
Tax breaks to industry for insulation	69	58	-11
Require utilities to burn less coal	68	63	-5
Tax breaks to homeowners for insulation	68	65	-3
Require communities to plant more trees	61	68	+7
More government funding for solar research	59	67	+8
Reduce the number of trees cut in the U.S.	57	69	+12

TABLE 54
Proposals That Were Rejected by the Scientists and the Panel
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Do it immediately/Phase it in"

Proposal	Scientists	Posttest	Difference
	%	%	
Drill for natural gas offshore	44	43	-1
10 cents a gallon gas tax over each of the next ten years	38	11	-27
Ban cars that get low gas mileage	37	25	-12
Require people to keep thermostat at 65	29	30	+1
Tax homeowners' use of heating oil	29	17	-12
Drill for natural gas in national parks	26	32	+6
Tax two-car families	16	11	-5
Ration gasoline (alternate day buying)	6	7	+1

TABLE 55
Proposals That Were Accepted By the Scientists and Rejected by the Panel
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Scientists	Posttest	Difference
	%	%	
Impose a tax on "gas guzzlers," cars that get poor gas mileage	75	37	-38
Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect)	68	45	-23
Give more aid to Brazil if they stop destroying the rain forests	50	38	-12
Raise the gasoline tax to 25 cents a gallon	50	11	-39

TABLE 56
Proposals That Were Rejected By the Scientists and Accepted by the Panel
(Comparison of Posttest and Scientists)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Do it immediately/Phase it in"

Proposal	Scientists	Posttest	Difference
	%	%	
Increase the miles-per-gallon standard to 50 by the year 2000	43	59	+16
Reimpose and strictly enforce a 55 miles-per-hour speed limit	43	52	+9

TABLE 57

Views About Proposals Involving Transportation (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Increase the miles-per-gallon standard for new cars to 40 mpg by the year 2000 even if that would increase the price of new cars and decrease the performance of full-size cars and station wagons"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	40	79	31	75	-4
Phase in	39		44		
Only if serious	14	19	11	21	+2
Don't do	5		10		
Not sure	2		4		

"Sharply increase spending on mass transit in urban areas even if that would mean a tax increase of about $50 per year per taxpayer"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	47	77	33	59	-18
Phase in	30		26		
Only if serious	10	17	15	32	+15
Don't do	7		17		
Not sure	6		9		

TABLE 58
Views About Proposals Involving Residential Energy Use (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Give tax breaks to homeowners who improve their home insulation even if that would mean a tax increase of about $50 per year per taxpayer"

		Scientists		Panel	
	Scientists	Total	Posttest	Total	Difference
	%	%	%	%	
Do immediately	40	68	36	65	-3
Phase in	28		29		
Only if serious	12	24	10	28	+4
Don't do	12		18		
Not sure	9		8		

"Give tax breaks to builders who construct homes and offices to take advantage of sunlight/ passive solar energy even if that would mean a tax increase of about $50 per year per taxpayer"

		Scientists		Panel	
	Scientists	Total	Posttest	Total	Difference
	%	%	%	%	
Do immediately	38	71	28	56	-15
Phase in	33		28		
Only if serious	12	22	13	34	+12
Don't do	10		21		
Not sure	7		10		

TABLE 59

Views About Proposals Involving Business and Industry (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Encourage industries to increase insulation and energy efficiency even if this would mean giving them large tax breaks"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	32	69	26	58	-11
Phase in	37		32		
Only if serious	13	25	15	35	+2
Don't do	12		20		
Not sure	6		7		

"Require businesses to improve fuel efficiency or use less energy, even if that would greatly increase their costs and the price of their products"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	19	69	32	70	+1
Phase	50		38		
Only if serious	18	27	18	24	-3
Don't do	9		6		
Not sure	4		8		

TABLE 59
(continued)

"Require utilities to burn less coal by using alternative fuels or increasing efficiency even if this means many coal miners would lose their jobs"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	21	68	20	63	-5
Phase in	47		43		
Only if serious	18	28	21	30	+2
Don't do	10		9		
Not sure	5		8		

TABLE 60
Views About Proposals Involving Trees
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Require communities to plant a large number of new trees each year even if that would mean a tax increase of about $50 per year per taxpayer"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	34	61	39	68	+7
Phase in	27		29		
Only if serious	15	30	13	26	-4
Don't do	15		13		
Not sure	8		6		

"Reduce the number of trees that can be cut in the U.S. each year even if this would increase the price of paper products and might even put some logging companies out of business"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	26	57	37	69	+12
Phase in	31		32		
Only if serious	19	36	19	27	-9
Don't do	17		8		
Not sure	7		5		

TABLE 61
Views About a Proposal Involving Solar Energy (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Increase government funding to spur development of solar energy even if many scientists doubt it will be a viable alternative in the future"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	37	59	39	67	+8
Phase in	22		28		
Only if serious	15	34	14	25	-9
Don't do	19		11		
Not sure	7		9		

TABLE 62
How Much Energy Could Solar Power Provide by the Year 2025?
(Scientists)

"How much of this country's energy could realistically be provided by active solar energy using photovoltaic cells by the year 2025?"

Percent of Energy Could Be Provided By Solar Power By the Year 2025	Scientists	Twenty percent or more
	%	%
Less than ten percent	29	
Ten to nineteen	36	
Twenty to twenty-nine	15	29
Thirty to thirty-nine	4	
Forty to forty-nine	2	
Fifty percent or more	8	
Not sure/no answer	8	

Mean = 16 percent.
Median = 10 percent.

• Due to rounding, percentages may not always add to 100%

TABLE 63
How Much Solar Power This Country Could Use? (Posttest)

"How much of this country's energy could realistically be provided by solar energy by the year 2025?"

How much could be provided by solar energy	Posttest	Ten percent or more
	%	%
Very little (less than 10%)	16	
Some but not a tremendous amount (10 to 20%)	33	70
A considerable amount (20 to 50%)	26	
More than half of our electricity	11	
Not sure	14	

TABLE 64

Views About Proposals Involving Transportation (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Raise the gasoline tax by 10 cents a year for each of the next ten years until the increase equals a total of $1.00 per gallon even if that would seriously burden truckers and others who need their cars for work"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	23	38	4	11	-27
Phase in	15		7		
Only if serious	25	55	21	85	+30
Don't do	30		64		
Not sure	8		4		

"Ban cars that get low gas mileage even if that means banning most sport cars and station wagons"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	14	37	9	25	-12
Phase in	23		16		
Only if serious	27	58	26	70	+12
Don't do	31		44		
Not sure	5		6		

TABLE 64
(continued)

"Discourage two-car families by making families that buy a second car pay a very steep tax even if this would be a hardship for many people"

		Scientists		Panel	
	Scientists	Total	Posttest	Total	Difference
	%	%	%	%	
Do immediately	5	16	4	11	-5
Phase in	11		7		
Only if serious	23	80	17	84	+4
Don't do	57		67		
Not sure	5		5		

"Ration gasoline through alternate day-of-the-week buying even if that would be a hardship for many people, especially those who need their car for work"

		Scientists		Panel	
	Scientists	Total	Posttest	Total	Difference
	%	%	%	%	
Do immediately	1	6	2	7	+1
Phase in	5		5		
Only if serious	29	91	20	91	nd
Don't do	62		71		
Not sure	3		3		

TABLE 65
Views About Proposals Involving Heating and Cooling the Home
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"While making exceptions for the elderly and the sick, require people to keep their thermostat no higher than 65 degrees even if this would be extremely difficult to enforce"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	15	29	15	30	+1
Phase in	14		15		
Only if serious	23	68	25	68	nd
Don't do	45		43		
Not sure	4		4		

"Discourage the use of heating oil, natural gas, and electricity through taxation even if that would significantly increase heating costs for homeowners and renters"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	7	29	5	17	-12
Phase in	22		12		
Only if serious	33	64	32	75	+11
Don't do	31		43		
Not sure	7		8		

TABLE 66
Views About Drilling for Natural Gas
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Encourage exploration for clean burning natural gas even if that would mean drilling in our national parks and threatening the environment"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	13	26	15	32	+6
Phase in	13		17		
Only if serious	28	68	37	61	-7
Don't do	40		24		
Not sure	6		7		

"Encourage exploration for clean burning natural gas even if that would mean drilling off the coast of California, the east coast, etc."

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	19	44	23	43	-1
Phase in	25		20		
Only if serious	24	51	35	50	-1
Don't do	27		15		
Not sure	5		7		

TABLE 67
Views About a Proposal Involving Nuclear Power Plants (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Build more nuclear power plants (which do not give off carbon dioxide that contributes to the greenhouse effect) even if that means living with the risks posed by that technology"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	38	68	20	45	-23
Phase in	30		25		
Only if serious	12	27	15	46	+19
Don't do	15		31		
Not sure	5		10		

TABLE 68
How Much Energy Should Nuclear Power Provide by the Year 2025?
(Scientists)

"How much of this country's energy should be provided by nuclear power plants (fission reactors) by the year 2025? (Nuclear power currently provides just under 10% of the country's energy)"

Percent of energy to be provided by nuclear power by the year 2025	Scientists	Twenty percent or more
	%	%
Less than ten percent	9	
Ten to nineteen	11	
Twenty to twenty-nine	25	75
Thirty to thirty-nine	10	
Forty to forty-nine	6	
Fifty percent or more	34	
Not sure/no answer	4	

Mean = 35 percent.
Median = 30 percent.

* Due to rounding, percentages may not always add to 100%

TABLE 69
How Much Energy Should Nuclear Power Provide by the Year 2025?
(Comparison of Pretest and Posttest)

"How much of this country's energy should be provided by nuclear power plants by the year 2025? (Nuclear power currently provides just under 10% of the country's energy)"

Amount of nuclear power by 2025:	Pretest	Twenty percent or more	Posttest	Twenty percent or more
	%	%	%	%
Very little (less than 10%)	13		19	
Some but not a tremendous amount (10 to 20%)	19		22	
A considerable amount (20 to 50%)	21	40	28	47
More than half of our electricity	19		19	
Not sure	28		12	

TABLE 70
Views About the Safety of Nuclear Power Plants
(Scientists)

"Indicate whether you agree or disagree with the statements below:"

"If safely built and managed, nuclear power plants (fission reactors) can be a safe, reliable source of energy."

Nuclear power plants can be a safe and reliable source of energy:	Scientists
	%
Agree	79
Disagree	12
Not sure	9

TABLE 71
Views About Nuclear Fusion
(Scientists)

"Indicate whether you agree or disagree with the statements below:"

"Nuclear fusion will not make a major contribution (more than 5%) to the world's energy needs by the year 2025"

Nuclear fusion will not make a major contribution:	Scientists
	%
Agree	48
Disagree	21
Not sure	30

TABLE 72
Views About Public Opinion
(Scientists)

"Which, if any, of these ideas do you think most Americans oppose today?"

"Building many more nuclear power plants:"

Most Americans Oppose Building Many More Nuclear Power Plants:	Scientists
	%
Agree	76
Disagree	12
Not sure	11

TABLE 73

Views About The Public's Perception of Risk (Scientists)

"Some scientists and other experts complain that the public has unrealistic expectations about risk, that people want a risk-free or 'zero risk' environment when there is no such thing. Are the public's expectations unrealistic when it comes to:"

"Nuclear power plants:"

Public expectations about the risk of nuclear power plants are:	Scientists
	%
Yes, unrealistic	62
No, not unrealistic	29
Not sure	9

TABLE 74
Views About Taxes on Gas Guzzlers
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Impose a tax on 'gas guzzlers,' cars that get poor gas mileage even if that would sharply increase the cost of full-size cars and station wagons"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	51	75	15	37	-38
Phase in	24		22		
Only if serious	13	22	20	60	+38
Don't do	9		40		
Not sure	2		4		

"Raise the gasoline tax by 25 cents a gallon even if that would burden truckers and others who need their cars for work"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	25	50	5	11	-39
Phase in	25		6		
Only if serious	20	44	22	87	+43
Don't do	24		65		
Not sure	6		3		

TABLE 75
Views About Public Opinion
(Scientists)

"Which, if any, of these ideas do you think most Americans oppose today?"

"Increasing the gasoline tax by at least 25 cents"

Most Americans Oppose Increasing the Gasoline Tax:	Scientists
	%
Agree	77
Disagree	12
Not sure	12

"Imposing a significant tax on 'gas guzzlers,' cars that get poor gas mileage"

Most Americans Oppose A Tax on Gas Guzzlers:	Scientists
	%
Agree	37
Disagree	35
Not sure	28

"Giving more aid to Brazil to stop them from cutting down rain forest"

Most Americans Oppose Giving More Aid to Brazil:	Scientists
	%
Agree	40
Disagree	21
Not sure	39

TABLE 76
Views About Foreign Aid to Stop Destroying the Rain Forest
(Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:
a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Give more aid to Brazil if they stop destroying the rain forests even if this means increasing foreign aid and cutting spending in other areas"

		Scientists		Panel	
	Scientists	Total	Posttest	Total	Difference
	%	%	%	%	
Do immediately	31	50	16	38	-12
Phase in	19		22		
Only if serious	14	35	18	50	+15
Don't do	21		32		
Not sure	16		11		

TABLE 77

Views About Proposals Involving Transportation (Comparison of Scientists and Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

"Reimpose and strictly enforce a nationwide speed limit of 55 mph even if that would inconvenience truckers and drivers, especially in western states"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	36	43	37	52	+9
Phase in	7		15		
Only if serious	22	52	21	46	-6
Don't do	30		25		
Not sure	5		2		

"Increase the miles-per-gallon standard for new cars to 50 mpg by the year 2000 even if that would sharply increase the price of new cars and decrease the performance of full-size cars and station wagons"

	Scientists	Scientists Total	Posttest	Panel Total	Difference
	%	%	%	%	
Do immediately	16	43	23	59	+16
Phase in	27		36		
Only if serious	27	49	22	35	-14
Don't do	22		13		
Not sure	8		7		

TABLE 78
Proposals To Address the Threat of Global Warming
(Comparison of Older and Younger Respondents, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Total	Age 18-29	65 and Older
	%	%	%
Increase the miles-per-gallon standard to 40 by the year 2000	75	73	73
Have the U.S. take the lead in international efforts to address the greenhouse effect	70	71	69
Reduce the number of trees that may be cut down in the U.S.	69	72	64
Require businesses to improve fuel efficiency	69	68	69
Require communities to plant a large number of new trees each year	68	71	66
Increase government funding for solar energy research	66	57	60
Give tax breaks to homeowners who improve home insulation	65	66	59
Require utilities to burn less coal	62	60	59
Increase the miles-per-gallon standard to 50 by the year 2000	59	56	61
Increase spending on mass transit	59	56	43
Give tax breaks to industries who increase insulation and energy efficiency	58	71	46
Give tax breaks to builders who take advantage of passive solar energy	56	63	49
Reimpose and strictly enforce a 55 miles-per-hour speed limit	52	38	56

TABLE 78
(continued)

Proposal	Total	Age 18-29	65 and Older
	%	%	%
Build more nuclear power plants	45	38	60
Drill for natural gas offshore	43	37	45
Give aid to Brazil to stop destroying the rain forests	38	38	42
Impose a tax on "gas guzzlers," cars that get poor gas mileage	37	24	44
Drill for natural gas in the national parks	32	22	47
Require people to keep their thermostats at 65 degrees	29	24	33
Ban cars that get low gas mileage	25	19	24
Tax homeowners' use of home heating oil	17	12	25
Impose a 10 cents per gallon tax over each of the next ten years	11	7	25
Impose a 25 cents per gallon gas tax	11	6	21
Tax two car families	11	3	19
Ration gasoline (alternate day buying)	7	3	10

TABLE 79
Proposals To Address the Threat of Global Warming (Comparison of Education Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Total	High School or Less	College Degree or More
	%	%	%
Increase the miles-per-gallon standard to 40 by the year 2000	75	69	86
Have the U.S. take the lead in international efforts to address the greenhouse effect	70	73	68
Reduce the number of trees that may be cut down in the U.S.	69	62	69
Require businesses to improve fuel efficiency	69	65	70
Require communities to plant a large number of new trees each year	68	67	67
Increase government funding for solar energy research	66	58	70
Give tax breaks to homeowners who improve home insulation	65	62	65
Require utilities to burn less coal	62	55	72
Increase the miles-per-gallon standard to 50 by the year 2000	59	56	72
Increase spending on mass transit	59	54	69
Give tax breaks to industries who increase insulation and energy efficiency	58	57	59
Give tax breaks to builders who take advantage of passive solar energy	56	49	64

TABLE 79
(continued)

Proposal	Total	High School or Less	College Degree or More
	%	%	%
Reimpose and strictly enforce a 55 miles-per-hour speed limit	52	61	41
Build more nuclear power plants	45	47	50
Drill for natural gas offshore	43	36	49
Give aid to Brazil to stop destroying the rain forests	38	41	40
Impose a tax on "gas guzzlers," cars that get poor gas mileage	37	27	46
Drill for natural gas in the national parks	32	27	32
Require people to keep their thermostats at 65 degrees	29	30	29
Ban cars that get low gas mileage	25	17	28
Tax homeowners' use of home heating oil	17	14	19
Impose a 10 cents per gallon tax over each of the next ten years	11	9	13
Impose a 25 cents per gallon gas tax	11	11	11
Tax two car families	11	16	9
Ration gasoline (alternate day buying)	7	10	3

TABLE 80
Proposals To Address the Threat of Global Warming (Comparison of Income Levels, Posttest)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Total	$30,000 or Less	$50,000 or More
	%	%	%
Increase the miles-per-gallon standard to 40 by the year 2000	75	75	79
Have the U.S. take the lead in international efforts to address the greenhouse effect	70	63	75
Reduce the number of trees that may be cut down in the U.S.	69	70	67
Require businesses to improve fuel efficiency	69	74	72
Require communities to plant a large number of new trees each year	68	71	70
Increase government funding for solar energy research	66	61	62
Give tax breaks to homeowners who improve home insulation	65	69	65
Require utilities to burn less coal	62	61	62
Increase the miles-per-gallon standard to 50 by the year 2000	59	60	61
Increase spending on mass transit	59	54	74
Give tax breaks to industries who increase insulation and energy efficiency	58	59	52
Give tax breaks to builders who take advantage of passive solar energy	56	52	66

TABLE 80
(continued)

Proposal	Total	$30,000 or Less	$50,000 or More
	%	%	%
Reimpose and strictly enforce a 55 miles-per-hour speed limit	52	53	56
Build more nuclear power plants	45	40	51
Drill for natural gas offshore	43	41	44
Give aid to Brazil to stop destroying the rain forests	38	43	38
Impose a tax on "gas guzzlers," cars that get poor gas mileage	37	32	43
Drill for natural gas in the national parks	32	34	33
Require people to keep their thermostats at 65 degrees	29	26	39
Ban cars that get low gas mileage	25	23	27
Tax homeowners' use of home heating oil	17	15	24
Impose a 10 cents per gallon tax over each of the next ten years	11	14	13
Impose a 25 cents per gallon gas tax	11	12	13
Tax two car families	11	10	12
Ration gasoline (alternate day buying)	7	6	6

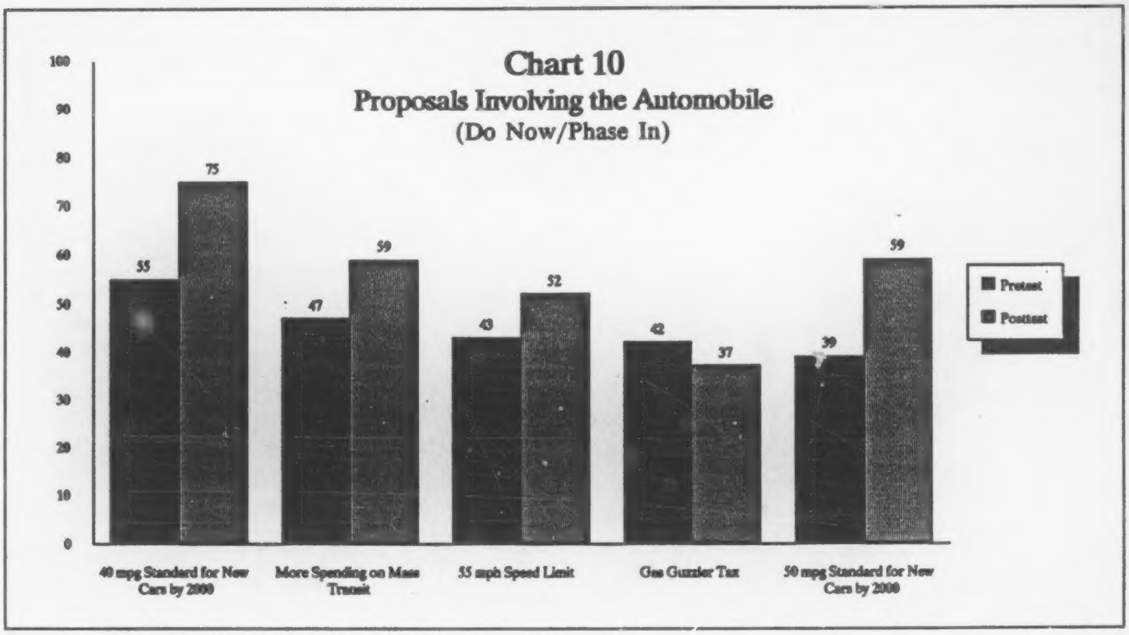


Chart 10
Proposals Involving the Automobile
(Do Now/Phase In)

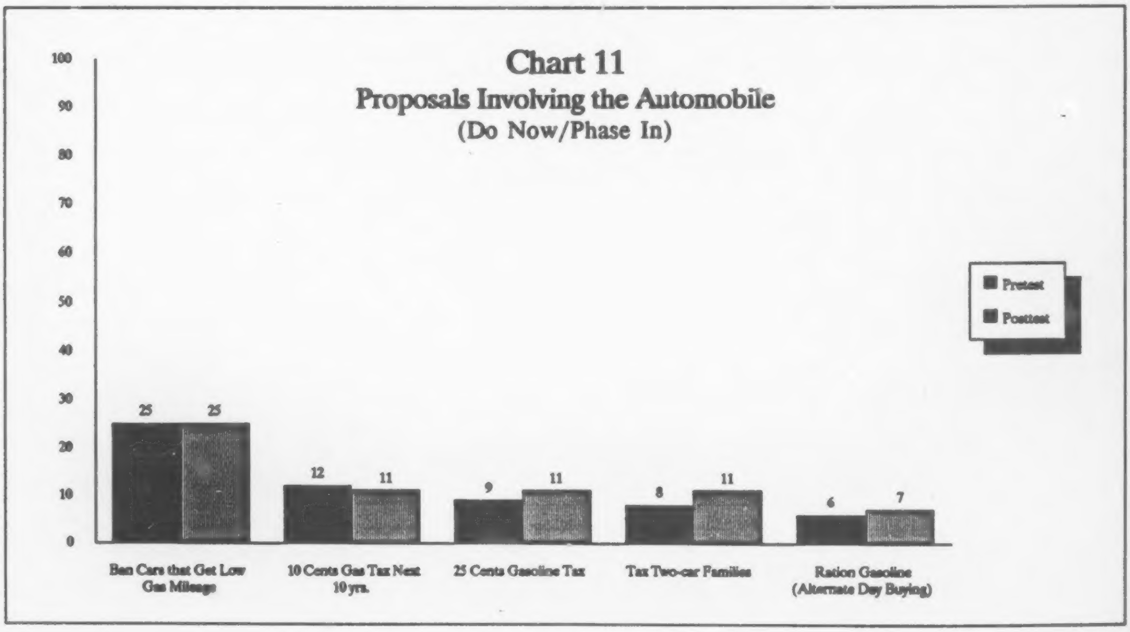


Chart 11
Proposals Involving the Automobile
(Do Now/Phase In)

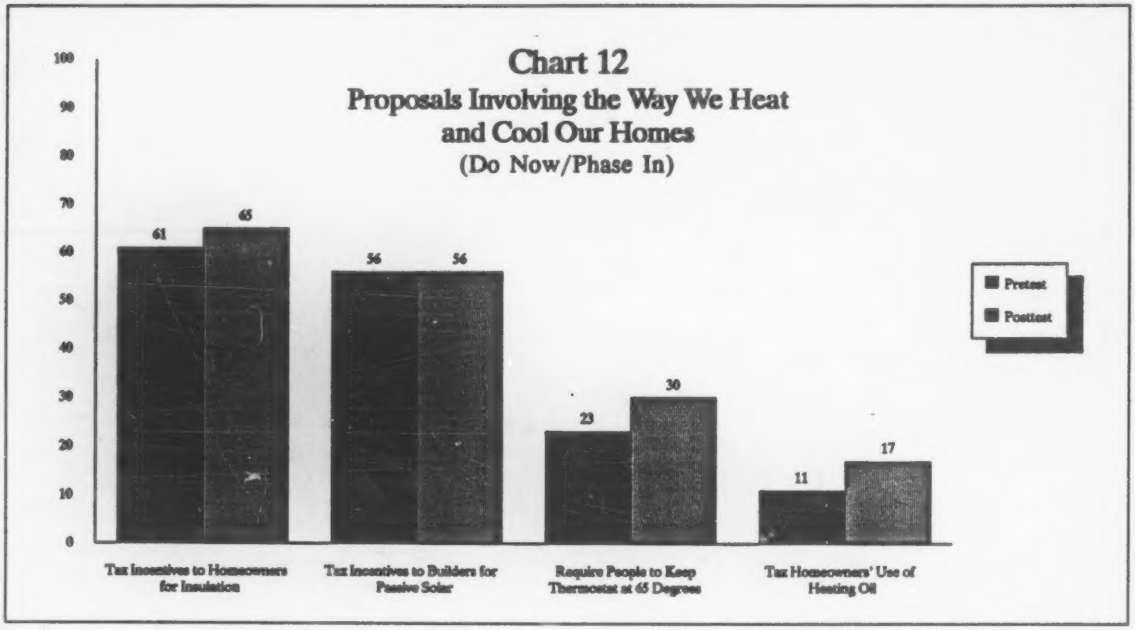


Chart 12
Proposals Involving the Way We Heat and Cool Our Homes
(Do Now/Phase In)

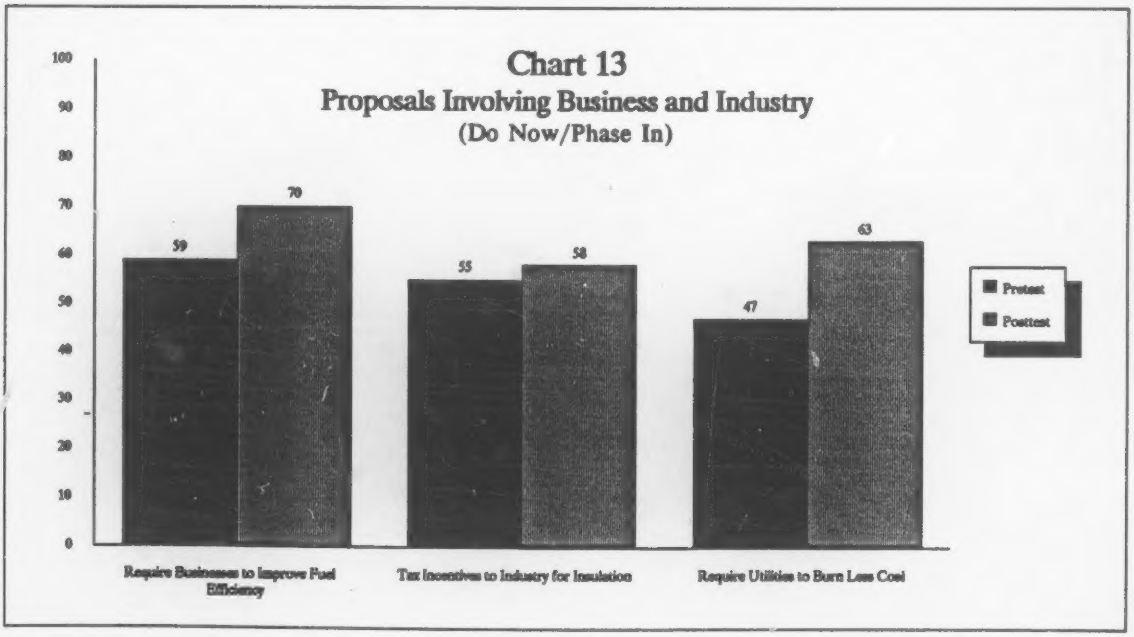


Chart 13
Proposals Involving Business and Industry
(Do Now/Phase In)

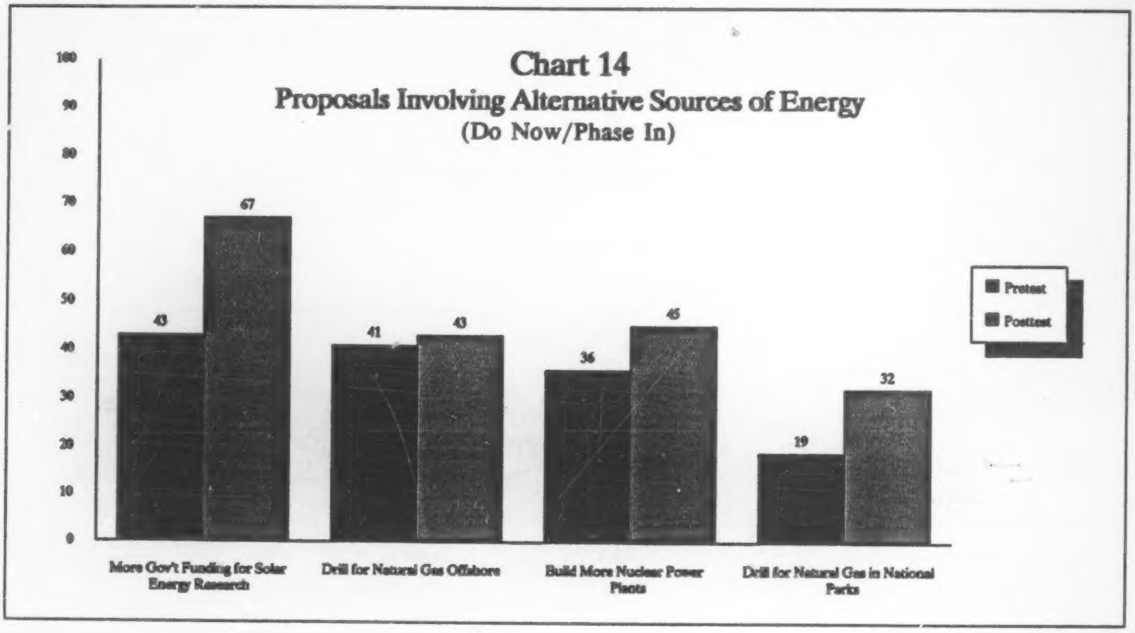


Chart 14
Proposals Involving Alternative Sources of Energy
(Do Now/Phase In)

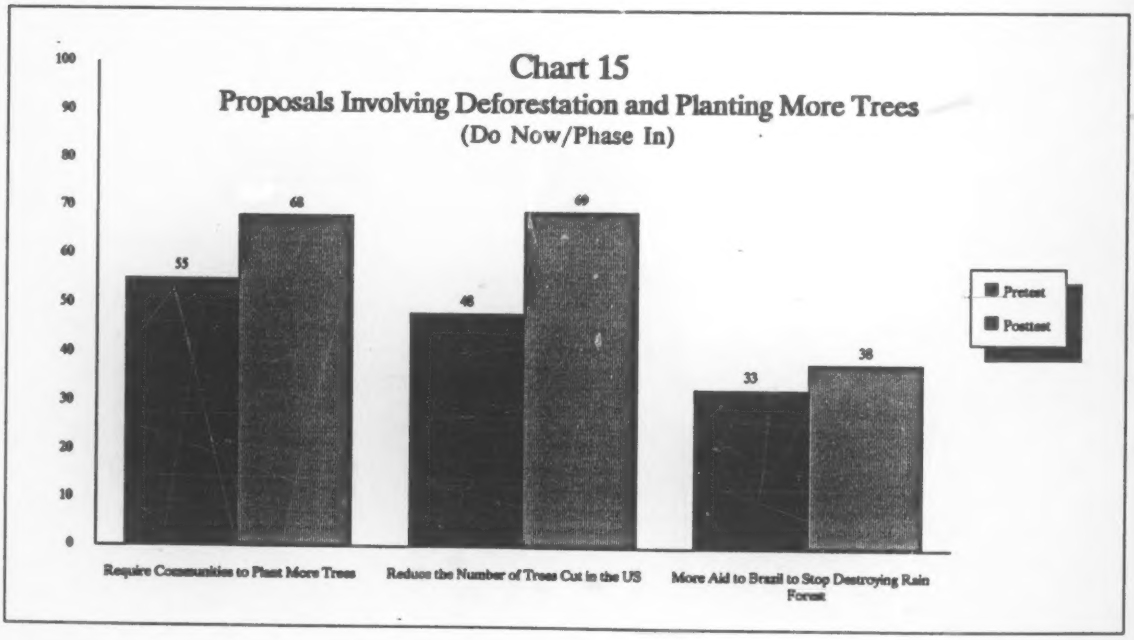


Chart 15
Proposals Involving Deforestation and Planting More Trees
(Do Now/Phase In)

Appendix A:
The Greenhouse Effect Intervention

The second half of the film and discussion focused on the threat of global warming caused by the greenhouse effect. The film described what scientists know and don't know about the greenhouse effect, the causes of greenhouse gas emissions, and various solutions. In the discussion we reviewed the material in the film and encouraged respondents to consider the different alternatives, their costs, and their benefits.

The film began with a brief description of global warming caused by the greenhouse effect. The respondents were told the earth is surrounded by a layer of gases including carbon dioxide. This layer acts like a natural greenhouse, allowing the sun's rays to pass through, but not permitting all the heat generated from the sun to escape back out. And, the film continued, as the concentration of carbon dioxide and other greenhouse gases in the atmosphere increases, scientists believe the earth's temperature will warm.

The film also explained the uncertainty surrounding this issue. Respondents were told that scientists disagree about what will happen and when. The film outlined two of the different views scientists hold on the effects of global warming. One position held that there would be severe changes in our earth's climate that would be visible within the next 50 or 60 years. These scientists maintained that the ocean level would rise, flooding coastal cities like New Orleans. In addition scientists holding this view predicted that changes in climate could turn the American midwest into a dustbowl, unable to sustain crops, making severe drought, famine and the diseases they cause would become commonplace around the world.

A second position was more moderate. Scientists holding this position believed the changes will be less drastic and more gradual. They predicted that agricultural crops would be able to adjust to the weather patterns and we would just grow corn further north in the future. Consistently, the ocean level would rise, perhaps enough to flood marshes and wetlands, but not enough to flood a city. Finally, respondents were told that a fair number of scientists were not sure about what the greenhouse effect would hold.

The respondents were then asked to consider five different areas where one could reduce greenhouse gas emissions: greatly reducing our use of the automobile or reducing consumption of gasoline; changing the way we heat and cool our homes; requiring or encouraging business and industry to reduce emissions; using alternative fuels that contribute fewer or no greenhouse gases (natural gas, nuclear, and solar); and planting more trees and cutting down less forest.

The film first addressed reducing our use of the automobile and cutting gasoline consumption. Respondents were told that about one-third of the carbon dioxide emissions in the U.S. comes from cars. They were asked to consider different options ranging from forcing car makers to produce more efficient cars to a gas tax to limiting the amount one could drive. The film discussed some arguments for and against each option, pointing out, for example, the high costs of retooling to improve auto efficiency, and the inequitability a gasoline tax might create.

The second set of solutions focused on the way people heat and cool their homes. Respondents were told utilities burn coal and oil in generating the electricity they sell to residences and that one way to reduce emissions would be to reduce our consumption of electricity. The proposals ranged from regulating household temperature, to giving tax incentives to individuals and builders to encourage energy conservation. Respondents were asked to keep in mind these steps would be inconvenient and very costly.

The third set of solutions addressed the way business and industry use energy. Respondents were asked to consider proposals requiring businesses and industry to increase energy efficiency or use less coal or giving them tax breaks to encourage energy conservation. They were asked to keep in mind that using less coal could seriously harm coal mining communities, and that increased costs to businesses would most certainly be passed along to the consumer.

The fourth set focused on three alternative sources of energy: natural gas, nuclear power, and solar power. Respondents were told that underground natural gas, when burned, gives off fewer carbon dioxide emissions per unit of energy than coal or oil but that the gas reserves are found primarily in national parks and off the coasts of California and the East. The film made it clear that emissions from a nuclear power plant do not contribute to the greenhouse effect or to air pollution of any kind, but that more nuclear power would require living with the risks posed by that technology. Finally respondents were told that scientists agreed solar energy would not be of much help in the next ten to twenty years no matter how much we invested.

The last set of options involved deforestation and reforestation. Respondents were told about photosynthesis and were then asked to consider the costs and benefits of giving more aid to countries like Brazil if it stops destroying the rain forests, as well as planting a large number of new trees in the United States.

A forty-five minute discussion followed the film in which we reviewed the material in the film and discussed the various alternatives to reducing greenhouse gases (a copy of the discussion guide given to each respondent follows). During the discussion on automobiles, respondents were asked to assume that there will be no technological breakthroughs in the next twenty years. In addition, the respondents were told that alternative fuels (methanol and ethanol) may help with air pollution but would not help substantially in addressing the greenhouse effect. During the discussion on deforestation and reforestation, respondents were told that last year an area of rain forest the size of Tennessee was lost to deforestation, and scientists agreed that in order to address the greenhouse effect by planting trees, the country would need to plant enough trees to cover half the U.S. each year.

Finally, it is important to note the intervention focused on reducing carbon dioxide emissions. Carbon dioxide is the most abundant greenhouse gas, there is little uncertainty about its increasing concentration, and, unlike methane and nitrous oxide, the sources of carbon dioxide can be readily understood by the public.

Since the U.S. contributes more carbon dioxide than any other country, we focused primarily on emissions coming from this country. We told the panel that while stabilizing the greenhouse effect would require international participation, a concerted effort to reduce carbon dioxide emissions from the U.S. would go a long way towards attaining this goal. Therefore respondents were asked to act as a citizens' review panel advising the President on the greenhouse effect and what this country should or should not do. We made it clear, however, that many people feel the greenhouse effect is a global problem and argue that Americans should not make wholesale changes until people in other countries act as well.

Appendix B:
DISCUSSION GUIDE #2

1. WHAT IS THE GREENHOUSE EFFECT?

Gases form a shield around the earth, letting heat from the sun in, but not out, like in a greenhouse. Scientists say these gases are building up so much that the earth will gradually warm up.

2. SCIENTISTS DISAGREE ABOUT WHAT WILL HAPPEN

Some scientists say that by the year 2050, there will be severe changes.

a. Rising temperatures will melt the polar ice caps, causing the oceans to rise and perhaps flooding coastal cities like New Orleans.

b. The midwest will become a dust bowl, unable to sustain crops; drought and famine will be commonplace.

Other scientists say that by 2075-2100 the effect will be more moderate.

a. The ocean may rise slightly, but it will be easy to guard against.

b. Gradual change in weather. In 100 years, we will grow corn in South Dakota and Minnesota instead of Nebraska and Iowa.

3. HOW CAN WE STOP THIS FROM HAPPENING?

a. Greatly reduce our use of the automobile
  - Force manufacturers to produce more fuel efficient cars
  - Discourage driving by increasing the price of gasoline
  - Tax gas guzzlers to discourage people from buying cars that get poor gas mileage.

b. Change the way we heat and cool our homes:
  - Regulate household temperature
  - Tax incentives to encourage energy conservation
  - Tax incentives to encourage building energy efficient homes

c. Force business and industry to cut emissions
  - Require increased fuel efficiency
  - Tax breaks to encourage energy efficiency

d. Alternative sources of energy:
  - More natural gas
  - More nuclear power
  - Invest more money in research of solar energy

e. Plant more trees and cut down less forest (trees absorb some of the greenhouse gases)
  - Increase aid to countries that preserve rain forests
  - Plant more new trees

Appendix C:
Methodology

The National Panel: To interview a representative cross section of the noninstitutionalized, voting age population of the United States, we drew a sample using quotas reflecting both regional and, when aggregated, the national population. The sample was designed using data in the *1986 State and Metropolitan Area Data Book* and the *1987 Statistical Abstract of the United States*, published by the U.S. Bureau of Census, and from three national surveys of over 1,000 people conducted by *Americans Talk Security*, a series of national, public opinion telephone surveys conducted by three prominent public opinion firms - - DYG Inc., Market Opinion Research, and Marttila and Kiley - in association with the Public Agenda Foundation. The methodology involved bringing together groups of about fifty people per night for sessions lasting just over three hours. A number of steps, detailed below, were involved in designing the panel.

First, our base for the national panel was designed to be 400 respondents, a large enough sample to provide statistical stability, and to permit regional and subgroup analysis.

Second, for administrative reasons, we conducted the panels in a total of four sites. Using standard Census Bureau divisions, we divided the United States into four principal regions: the Northeast, Midwest, South, and West[22], and drew a sample proportionate to each region's share of the national population. That is, since 22 percent of the nation's population lives in the Northeast, the sample was designed so that about 22 percent of our sample would come from the site chosen to represent that region. (See Table 81.)

Third, since there was no significant regional variation on the basis of sex, our sample quota was 50 percent male and 50 percent female.

Fourth, since there was also no significant regional variation in terms of the average (or mean) age of the population, we collected data about this variable using three national surveys and compiled a three-survey average. This average then became part of the recruiting specifications for each site. That is, in the U.S. as a whole, 23 percent of the noninstitutionalized voting age population is between the ages

of 18 and 29. Therefore, in each of our four sites, 23 percent of the respondents were to be between 18 and 29 years of age. (See Table 82.)

Fifth, we identified three key demographic indicators for which there was significant regional variation and which could also be used as recruiting specifications: race, education and median family income. We then compiled data about each region's demography in terms of those variables.

Sixth, we identified a particular site to represent each of the four regions. Since each site was, in effect, a proxy for the region as a whole, it had to meet a variety of criteria:

a) Each site had to reflect the region's demographic makeup using three key indicators: race, education and median family income. After compiling the regional data, we compared it to the demography of a list of candidate sites within each region and looked for the best match. The demography of the adult population in each site's metropolitan statistical area (MSA) had to approximately reflect the region as a whole. For example, Hartford was the site chosen to represent the Northeast. In the Northeast region of the U.S., 10 percent of the population is black/African-American compared to 7 percent in the Hartford MSA. In terms of education, 33 percent of the people in the Northeast population have less than 12 years of school compared to 30 percent of the people in greater Hartford. According to the Census Bureau, the 1985 median family income for the Northeast was $20,651 in 1986 and $23,372 for Hartford. (See Table 83 and 84.)

b) Each site had to represent the region's central social, demographic, cultural and historical character. In each case, we wanted a site that did not have either a unique ethnic mix or history, or an atypical industrial base compared to the region as a whole. Thus, for example, Providence was rejected because it has a large Portuguese population. New Haven was rejected because it is so influenced by the presence of Yale University. New Orleans was rejected because of its history, atypical ethnic makeup and dependence on tourism.

c) Each topic was taken into consideration. Since solid waste is a local problem, we wanted sites that had at least some controversy with this issue; otherwise, respondents might have found questions about the issue meaningless. A large number of southern cities that otherwise might have been a good match for the region as a whole (such as

Birmingham, for example) did not have much of a solid waste problem. Landfill costs are low and space for new landfills is comparatively abundant in many parts of the south. However, in Nashville solid waste disposal has been a major issue.

d) Our other topic, the greenhouse effect, is a national/global issue, not a local one. However, since so many of the proposals to reduce emissions contributing to the buildup of greenhouse gases involve the automobile, we rejected certain sites such as Detroit that are economically dependent on the automobile industry.

e) Finally, each site had to be large enough to have a recruiting agency that could bring together enough people to meet our quotas. After establishing quotas based on sex, race and education for each site, we used them as recruiting specifications for the organizations working with us to recruit respondents.

After taking all this into consideration, we chose the following sites:
Nashville, TN to represent the South;
Chicago, IL to represent the Midwest;
Los Angeles, CA to represent the West; and
Hartford, CT to represent the Northeast.

When the research was completed and the sample was aggregated, we compared it to national totals of certain variables, including some, such as political party, that were not part of the recruiting specifications but which, in a well drawn sample, should match the national totals within a few percentage points. All discrepancies between the mean score for any site and region resemble normal sample variations using a national probability sample of 402 respondents. As is standard procedure using even national probability samples drawn using both listed and unlisted telephone numbers, we then weighted the data to bring the demographics more into line with the national totals. The only variables where the number of respondents differed significantly from the recruiting specifications were education (in that the panel included more respondents with "some college" and fewer with a "high school education or less" than the quotas called for) and the income (in that panel included fewer respondents with an annual family income of $30,000 or less and more with an income of $30,000 to $50,000). In Table 85, we show the weighted sample compared to the quota used to recruit respondents. In Tables 86 and 87, we present the weighted and unweighted data compared to national totals determined by U.S. Census data and the three ATS surveys. (See Tables 85 to 87.)

TABLE 81
Targeted Panel Composition by Region (US Census and Panel)

Area	Population	U.S. Pop.	Quota	Actual Sample	Sample Size
	(in millions)	%	%	%	(respondents)
National Total	239	100	100	100	402
Northeast	50	22	22	21	84
Midwest	59	25	25	24	97
South/West Central	82	34	34	33	133
West	48	20	20	22	87

TABLE 82
National Distribution By Age Group (ATS)

Age	ATS #1	ATS #6	ATS #12	3 Survey Average
	%	%	%	%
18 to 29	26	22	22	23
30 to 39	21	24	22	22
40 to 49	19	17	19	18
50 to 64	19	19	19	19
65 and over	15	17	18	17

* Due to rounding, percentages may not always add to 100%.

TABLE 83
Targeted Panel Composition By Key Demographics (U.S. Census and Panel)

Area	Race			Education			Income
	Black Afr-Amer	White	Hispanic	Less than 12 years	12-16 years	16+ years	Median Family
	%	%	%	%	%	%	(1985)
National Total	12	83	6	34	50	16	$19,917
Northeast	10	86	5	33	50	17	$20,651
Midwest	9	89	2	32	53	15	$20,988
South/W. Central	19	78	6	40	45	15	$17,857
West	5	81	15	26	55	19	$20,974

TABLE 84
Targeted Panel Demographics By Region and Site (Panel Targets)

Region/Site	Race			Education			Income
	Black/ Afr-Amer	White	Hispanic	12 yrs or less	12-16 years	16+ years	Median Family
	%	%	%	%	%	%	(1985)
National Total	12	83	6	34	50	16	$19,917
Northeast	10	86	5	33	50	17	$20,651
Hartford, CT.	7	90	4	30	50	20	$23,372
Midwest	9	89	2	32	53	15	$20,988
Chicago, IL.	20	74	8	33	49	18	$24,514
South	19	78	6	40	45	15	$17,857
Nashville, TN.	16	83	1	36	47	17	$19,654
West	5	81	15	26	55	19	$20,974
Los Angeles, CA.	9	74	24	28	54	18	$21,744

* Due to rounding, percentages may not always add to 100%.

TABLE 85
Comparison of Quotas to the Weighted Panel Sample (Quotas and Panel)

		Sample Quotas	Weighted Sample
		%	%
Region	Northeast	22	21
	Midwest	25	24
	South	34	33
	West	20	22
Sex	Male	50	50
	Female	50	50
Age	18-29	23	22
	30-39	24	24
	40-49	19	18
	50-64	19	19
	65/over	15	17
Education	12 yr. or less	34	37
	12-16 yr.	50	37
	16 yr./more	16	25
Race	Black/ African-American	12	7
	Hispanic	6	6
	White	83	84
	Asian	NA	2
Income	Less than $30,000	56	39
	$30,000-$50,000	27	39
	Over $50,000	17	21
Party	Republican	41	39
	Democrat	44	46
	Independent or other	15	15

* Due to rounding, numbers may not always add to 100%

TABLE 86
Comparison of U.S. Census Data to Unweighted and Weighted Sample
(U.S. Census and Panel)

		Unweighted U.S. Census	Weighted Sample	Sample
		%	%	%
Region	Northeast	22	20	21
	Midwest	25	25	24
	South	34	36	33
	West	20	21	22
Sex	Male	49	45	50
	Female	51	54	50

* Due to rounding, percentages may not always add to 100%

TABLE 87
Comparison of ATS Sample to Unweighted and Weighted Sample
(ATS and Panel)

		3 Survey Average	Sample Unweighted Results	Sample Weighted Results
		%	%	%
Age	18-29	23	23	22
	30-39	22	24	24
	40-49	18	18	18
	50-64	19	19	19
	65/over	17	15	17
Education	12 yr. or less	46	25	37
	12-16 yr.	26	47	37
	16 yr./more	27	24	25
Race	Black/Afr-Amer	10	11	7
	Hispanic	3	8	6
	White	84	80	84
	Asian	1	2	2

* Due to rounding, numbers may not always add to 100%

Demographic Sources:

Americans Talk Security #1, Marttila & Kiley, October, 1987.

Americans Talk Security #6, Marttila & Kiley, May, 1988.

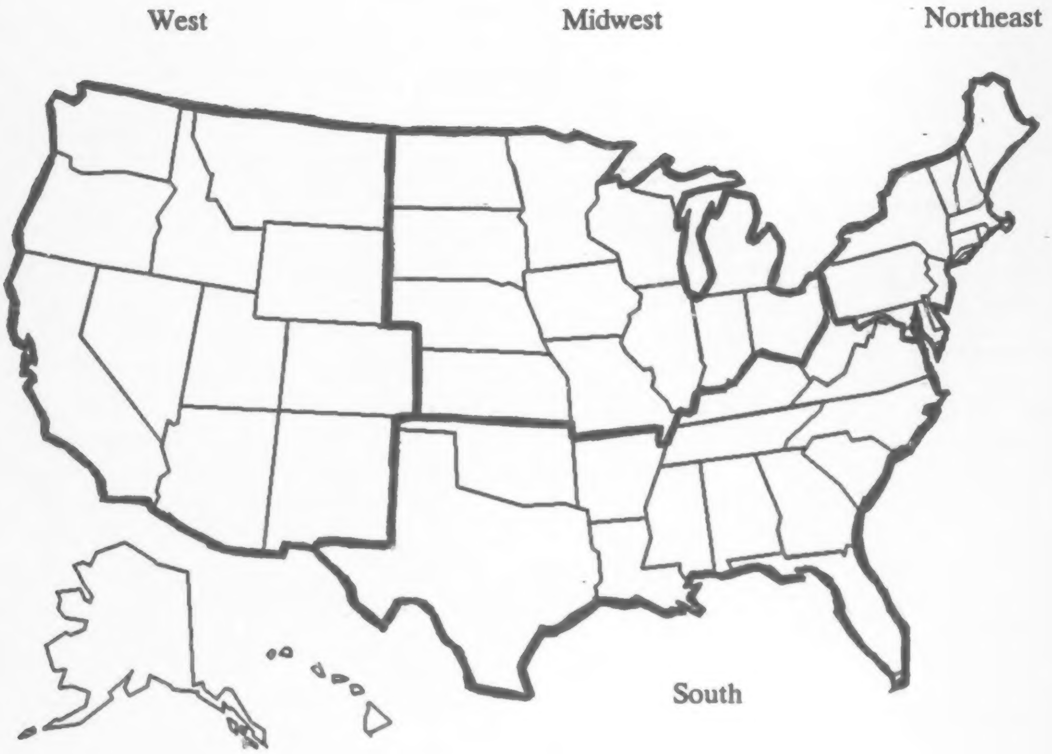
Americans Talk Security #12, Market Opinion Research, January, 1989.

1986 State and Metropolitan Area Data Book, U.S. Bureau of Census, 1986.

1987 Statistical Abstract of the United States, U.S. Bureau of Census, 1987.

Diagram 1

Map of Regions


West
Midwest
Northeast
South

Appendix D:
The Leading Scientists

The Public Agenda Foundation interviewed a total of 418 of this country's leading scientists and other prominent members of the scientific community by mail between June 19, 1989 and September 11, 1989. Questionnaires with a cover letter and a self-addressed return envelope were sent out to 1500 leading scientists chosen at random by Research Projects Corporation of Woodbury, CT using *American Men And Women in Science, The 17th Edition*, by R.R. Bowker, *Who's Who in America* among other reference volumes. The rate of completed interviews returned from those originally sent out was 28 percent. The 418 leading scientists interviewed represent a broad spectrum of scientific disciplines, including computer and social sciences. Our respondents were not necessarily experts in either solid waste or the threat of global warming. It is tempting to assume that a survey of experts in the two areas might yield different results. However, in our survey, those who considered themselves very knowledgeable about solid waste and the greenhouse effect did not hold different views about how to address the two issues. We asked the scientists if they considered themselves very knowledgeable, somewhat knowledgeable, or not very knowledgeable about the two issues. In the tables below we compare the views of those who are very knowledgeable (24 percent) to the total sample. There are very few substantial differences between the two groups. (See Tables 88 through 93.)

TABLE 88
Sample Demographics
(Scientists)

	Percent of Sample
	%
Field of Science	
Chemistry	24
Biology/Health Sciences	21
Earth sciences (including geophysics)	19
Physics	19
Social Sciences	6
Engineering	4
Computer Sciences	3
All Other	5
Education Level	
College graduate or less	4
Some graduate school	14
Ph.D. or post-doctoral work	82
Gender	
Male	89
Female	10
Prefer not to answer	1
Political Party	
Republican	26
Democrat	37
Independent	34
Not sure	1
Prefer not to answer	2
Knowledge About Solid Waste*	
Very knowledgeable	14
Somewhat knowledgeable	59
Not very knowledgeable	25
Not sure	2
Knowledge About the Greenhouse Effect*	
Very knowledgeable	24
Somewhat knowledgeable	63
Not very knowledgeable	11
Not sure	2

TABLE 89
Assessment of the Threat of Global Warming
(Comparison of Scientists with Varying Knowledge About the Greenhouse Effect)

"Which statement comes closer to your own view?

If things keep going as they are, by about 2050 global warming caused by the greenhouse effect will:

A. Cause widespread flooding, drought, famine and environmental devastation.
OR
B. Cause slow, incremental change in the environment such as increased cloud cover and gradual changes in the latitudes where corn and wheat will grow."

Statement	Total	Very Knowledgeable	Difference
	%	%	
Cause widespread environmental devastation	10	13	+3
Cause slow, incremental change	76	76	nd
Not sure	14	12	

TABLE 90
Should We Take Action or Wait for More Evidence?
(Comparison of Scientists with Varying Knowledge About the Greenhouse Effect)

"Which statement comes closer to your own view?

A. Before taking decisive action to deal with the greenhouse effect, we should wait for more conclusive scientific evidence.
OR
B. If we wait for more conclusive scientific evidence before taking decisive action to deal with the greenhouse effect, it will be too late."

Statement	Total	Very Knowledgeable	Difference
	%	%	
Wait for more conclusive evidence	34	33	-1
If we wait, it will be too late	58	62	+4
Not sure	8	5	

TABLE 91
Has Global Warming Already Started?
(Comparison of Scientists with Varying Knowledge About the Greenhouse Effect)

"Indicate whether you agree or disagree with the statements below:"

"Global warming caused by the greenhouse effect has already started."

Global warming has started:	Total	Very Knowledgeable	Difference
	%	%	
Agree	40	42	+2
Disagree	13	18	+5
Not sure	47	40	

TABLE 92
Predictions About Global Warming Caused By The Greenhouse Effect
(Comparison of Scientists with Varying Knowledge About the Greenhouse Effect)

"Indicate whether you agree or disagree with the statements below."

"Unless we take action, global warming caused by the greenhouse effect will cause major, widespread environmental devastation by the year 2000."

Global warming will cause environmental devastation:	Total	Very Knowledgeable	Difference
	%	%	
By the year 2000			
Agree	6	4	-2
Disagree	59	65	+6
Not sure	35	31	
By the year 2050			
Agree	29	33	+4
Disagree	19	26	+7
Not sure	52	41	
By the year 2100			
Agree	55	58	+3
Disagree	8	8	nd
Not sure	38	34	

TABLE 93
Proposals To Address the Threat of Global Warming
(Comparison of Scientists with Varying Knowledge About the Greenhouse Effect)

"Here are some steps we might take to deal with the greenhouse effect, but each has an accompanying sacrifice. Keeping in mind the sacrifice involved, indicate whether you would:

a. Do it immediately
b. Phase it in gradually, over the next 10 years or so
c. Do it only if further evidence suggests the greenhouse effect will have catastrophic effects by about the year 2050
d. Don't do it, no matter what"

	"Do it immediately/Phase it in"		
Proposal	Total	Very Knowledgeable	Difference
	%	%	
Increase the miles-per-gallon standard to 40 by the year 2000	79	76	-3
Increase spending on mass transit	77	78	+1
Impose a tax on "gas guzzlers," cars that get poor gas mileage	75	83	+8
Give tax breaks to builders who take advantage of passive solar energy	71	73	+2
Have the U.S. take the lead in international efforts to address the greenhouse effect	70	69	-1
Require businesses to improve fuel efficiency	69	74	+5
Give tax breaks to industries who increase insulation and energy efficiency	69	71	+2
Require utilities to burn less coal	68	76	+8
Give tax breaks to homeowners who improve home insulation	68	67	-1
Build more nuclear power plants	68	66	-2
Require communities to plant a large number of new trees each year	61	56	-5
Increase government funding for solar energy research	59	65	+6
Reduce the number of trees that may be cut down in the U.S.	57	63	+6

TABLE 93
(continued)

Proposal	Total	Very Knowledgeable	Difference
	%	%	
Impose a 25 cents per gallon gas tax	50	54	+4
Give aid to Brazil to stop destroying the rain forests	50	54	+4
Drill for natural gas offshore	45	42	-3
Reimpose and strictly enforce a 55 miles-per-hour speed limit	43	48	+5
Increase the miles-per-gallon standard to 50 by the year 2000	43	47	+4
Impose a 10 cents per gallon tax over each of the next ten years	38	44	+6
Ban cars that get low gas mileage	37	40	+3
Tax homeowners' use of home heating oil	29	31	+2
Require people to keep their thermostats at 65 degrees	29	31	+2
Drill for natural gas in the national parks	26	24	-2
Tax two car families	16	16	nd
Ration gasoline (alternate day buying)	6	3	-3

Appendix E:

Experts Interviewed by The Public Agenda Foundation

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